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During the months of February, March, and April 1951, the headquarters of FAO was transferred from Washington, D. C., U.S.A. to Rome, Italy. There was of necessity a disruption in the work of the organization. For this reason the first two issues for 1951 of the *FAO Fisheries Bulletin* have been combined into this one number.

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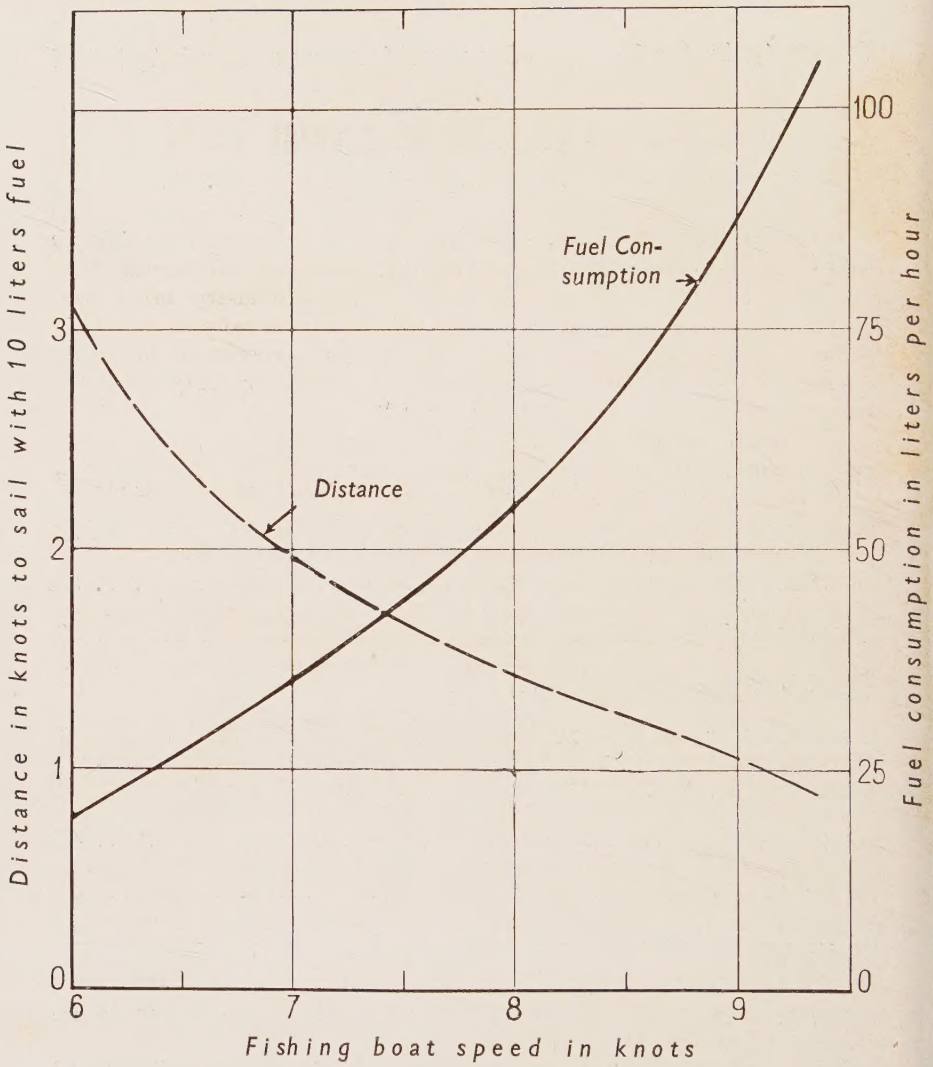
Fig. 1



Full-scale trials of fishing boats are highly recommended. The results give owners and boatbuilders very useful information on the performance of their boats and enable them to compare boats of different designs. The above curves show the results of trials of a Canadian dragger, *Halfish*, carried out February 1951 in Halifax by the Fisheries Loan Board of Nova Scotia, Canada, in co-operation with the FAO Fisheries Division. The results are discussed in the article "Improving the Design of Fishing Boats."

IMPROVING THE DESIGN OF FISHING BOATS

The fishing boat is generally the most important piece of equipment in the fishing industry. Boats are necessary to harvest the waters, and the financial success of the fisheries industry often depends on their being designed to perform as economically as possible. If they are wrongly planned, great difficulty and expense are involved in rebuilding them. Mistakes in shape are practically impossible to correct.

Different fishing methods, locations, availability of material, and developments have evolved fishing boats of entirely different types and sizes. It would be futile to look for the " world's best fishing boat ": boats can be good or bad for a specific place or purpose but never good for all localities and all conditions. Nevertheless, boats can often be greatly improved by the incorporation of ideas from fishing craft of other countries. The development of design is an ever-continuing process. All countries, and especially the technically underdeveloped countries, can therefore benefit from studying other fishing boat types.

Fishing boats, like yachts and tugboats, are really ships, hence they are not exempt from the rules of naval architecture. Though they are of many different types and arrangements, they all have many aspects in common. They must be seaworthy, seakindly, safe, and capable of attaining good speed. The price, and the operating and maintenance expenses, must be as low as possible. These qualities, to a considerable extent, are connected with the shape of the hull. Hence, the results obtained with one type may be useful in planning other types.

It is easy to build a boat which floats and which can make relatively good speed. Such a boat can be built without much experience, engineering knowledge, or planning ; but to build boats which will operate economically requires study, hard work, and an open mind. Most fishing boats today are of empirical, sometimes even of rustic, design. They are often designed and built by men familiar with one particular size and type, but without much experience in other fields of naval architecture. Since relatively little has been published on fishing boat design, the men engaged in this activity have had few oppor-

tunities to learn from the experience of others. In many cases the builders of fishing boats, like the fishermen, are relatively poor, hard-working men who seldom have opportunities to travel, to study the technical literature, or to seek a higher education. Furthermore, language differences often make closer communications difficult.

In the fisheries industry the capital invested in the fishing boats is probably larger than that invested in any other phase of the industry. It is therefore of the utmost importance that boats be built so that they will perform as economically and efficiently as possible and incorporate all modern knowledge of naval architecture, etc. Little information is available as to the actual amount invested in the fishing fleets. However, Table 1, compiled by the Economics Branch of the FAO Fisheries Division, shows that very large sums are involved.

TABLE 1. — NUMBER AND ESTIMATED VALUE OF CRAFT OF SELECTED COUNTRIES

Country	Year	Number of craft	Estimated value, US$
Canada	1945	38,400	22,300,000
Denmark	1944	16,200	15,000,000
Scotland	1938	5,100	9,900,000
Sweden	1944	21,700	11,200,000

For the United States of America, the Fish and Wildlife Service of the Department of the Interior has calculated that for the year 1946 the total capitalized value in the United States fisheries industries was US$9,795,355,000. This capital was distributed as follows: $4,743,750,000 invested in boats and gear, etc., $1,320,263,000 in manufacturing operations, $1,707,614,000 in wholesale operations, and $2,023,728,000 in retailing. Thus the boats and gear, of which the boats of course are the major item, account for more than 48 percent of the total capitalized value of the whole industry. This figure shows the overwhelming importance of the capital involved in fishing craft. With this in mind it is easy to see that it is of the utmost importance that the boats be designed as well as possible.

Fisheries administrators are often directly concerned with the development of fishing boats, because governments often have credit programs to assist fishermen in financing their craft. Often, controls and inspections are made primarily to ensure soundness of construction. Such controls, however, should be continuously reviewed. Otherwise

they may prevent improvements. Fisheries administrators would do well to encourage the investigation of fuel consumption, operation and maintenance costs, and the general performance of available boats. They could profitably consult with naval architects and other experts for advice on long-term programs of improving the boats. The fisherman may consider this an unnecessary expense and one beyond his financial reach. Such expenses might well be borne by public authorities or fishermen's associations, as the experience gained may be beneficial not only to one boat but to the whole fishing fleet of an area. In this way vastly improved performance and greatly lowered cost of operation may often be possible.

General Remarks on Fishing Boat Design

Table 2 shows main dimensions of different fishing boat types. From the table it can be seen that boats of different sizes and types have different relative proportions. If a good design has been developed for a boat it often happens that such a design is lengthened simply by putting some more frames amidship. This is often undesirable, for it is not at all certain that the original good qualities will be retained after the change. The boat is likely to be too narrow, and a parallel middle body is not suitable for fishing boats. On the other hand, if the lines are scaled up proportionally, it will perhaps result in a boat which is too beamy. Similarly, a boat of a well-balanced and good design may be offset by the introduction of a different type engine, heavier scantlings or auxiliaries, bigger deckhouse, etc. Any such alterations usually require reconsideration of the hull shape, a factor all too often forgotten.

One of the most important requirements in boat design is that the weight of the boat should correspond to the designed displacement or calculated weight. Another is that the boat should float parallel to the designed waterline. If the actual weight of the boat is lower than calculated, the mistake can be corrected by adding ballast, but this means that a heavier body than necessary has to be plowed through the water, which adds to the running cost. A more common and worse mistake occurs when fishing boats weigh more than has been calculated; this often means that they cannot carry the expected load. Determination of the correct hull weight requires computation of the weight and center of gravity of every single part of the boat; this requires much experience and long hours of work. Since a fishing boat designer seldom gets paid for such an amount of work, and the customer hardly ever asks for it, the designer often uses rule-of-thumb computation or guesswork. In the long run, the owner pays for the mistakes through higher operating cost and inferior performance.

TABLE 2. — DIMENSIONS OF SELECTED TYPES OF FISHING BOATS

Boat	Type	Country	L	B	d	∇	L/B	B/d	L/d	$L/\nabla^{1/3}$	δ	β	φ	Θ %
Gérard Tréca	Trawler	France	18.0	5.15	1.67	65	3.5	3.08	10.8	4.48	.42	.754	.557	−5.6
Silver Scout	Drifter	U. K.	18.9	5.26	1.8	68.2	3.58	2.92	10.5	4.63	.381	.589	.647	—
Silver Searcher ..	Drifter	U. K.	18.9	5.34	1.97	70.8	3.54	2.71	9.6	4.57	.357	.670	.533	—
Eystrasalt	Research trawler	Sweden.....	19.25	5.86	2.19	108	3.28	2.68	8.8	4.04	.437	.693	.630	−1
Caprice	Trawler	Sweden.....	19.7	6.15	2.34	115	3.20	2.63	8.42	4.05	.406	.614	.661	±0
Jens Vaever	Research trawler	Denmark...	25.5	7·14	2.14	200	3.57	3.34	11.9	4.35	.514	—	—	—
Maria Julia.....	Research trawler	Iceland	28.4	6.50	2.53	204	4.37	2.57	11.22	4.82	.437	.765	.572	—
Halfish	Tuna clipper....	Canada	31.08	7.30	3.04	327	4.27	2.40	10.2	4.51	.473	.717	.660	−2.7
White Star	Trawler	U.S.A.	40.0	10.10	3.97	830	3.97	2.54	10.1	4.25	.517	—	—	—

NOTES :

All measurements are metric.
L = Datum waterline in meters.
B = Beam in datum waterline in meters.
d = Mean draught at midship section to rabbet line in meters.
∇ = Displacement in m^3.
L/B = Length-beam ratio.
B/d = Beam draught ratio.
L/d = Length-draught ratio.
$L/\nabla^{1/3}$ = Length-displacement ratio.
A = Area of immersed midshipsection in m^2.

$\delta = \frac{\nabla}{LBd}$ = Block coefficient (the ratio of the immersed volume to the product of waterline length, beam and draught).

$\beta = \frac{A}{Bd}$ = Midship section coefficient (the ratio of immersed midship section to the product of beam and draught).

$\varphi = \frac{\delta}{\beta} = \frac{\nabla}{L\,A}$ = Prismatic coefficient (also called longitudinal or cylinder coefficient. The ratio of the volume of the displacement to the product of its length and immersed area of midship section.)

Θ = Longitudinal location of the center of buoyancy fore or aft of the ½ L expressed in percent of the L.

Seaworthiness, Seakindliness, and Stability

Seaworthiness means mainly that the boat has sufficient stability to weather a storm, that it has strong construction, dependable machinery, and healthy crew quarters.

Seakindliness means agreeable motions in different kinds of seaways, which permit fishing and higher speed in bad weather, with as little strain as possible on the crew and on the structural members of the boat.

It is clear that fishing boats must be as seaworthy and as seakindly as possible. However, "a vessel can be seaworthy and still pitch and buck so that only a cowboy can stay aboard her" (Steele, 1950). This necessitates study of the question of stability.

Stability is the capacity of a ship to return to the original position when inclined away from it. High stability is obtained by a low center of gravity, e.g. much ballast in the bottom, low and light-weight superstructures, etc., and a broad beam. Low stability is due to a high center of gravity and a narrow beam. The degree of stability determines the boat's period of roll; high stability gives a short period of roll, low stability a long period. The period of roll is about the same for all angles of roll and all weather conditions. The period of roll can be checked in calm water at the wharf, for the boat will have about the same period of roll there as at sea. A rapidly rolling boat is "unsteady," "unstable," and uncomfortable for the crew. A slowly rolling boat makes bigger amplitudes but the angular speed is likely to be less and the boat is steadier. Thus, paradoxically, the boat with less stability is more agreeable and seakindlier.

If the period of roll and the period of the waves are about the same, the result will be synchronized rolling, resulting in rolls of wide amplitude. Therefore, care should be taken to place a limit of the period of roll of the boat. If, for example, a boat has a stability which gives it a rolling period of 6 seconds, synchronism occurs in waves of about 6 seconds period. In open sea this may correspond to 12 ft. (3.7 m.) high waves (Manning 1939). The stability may well be sufficient to meet synchronism under such conditions. If the boat has a rolling period of 8 seconds the synchronism occurs at 24 knots (12.3 sec/m.) wind velocity and 18 ft. (5.5 m.) high waves. In this case the boat's stability is less than in the former case and may be too little to meet the synchronism in these bigger waves. The length and height of the waves and the relation between wave-period and wind velocity varies in open and coastal water, depending upon the length of time the wind has blown and other factors. Few studies have been made of the problem of the effect of sea on fishing boats in relation to minimum stability.

It has been suggested that an agreeable period of roll over and back is equal to as many seconds as the boat is broad in meters. The sta-

bility is then sufficient and the boat's movements are at the same time agreeable. From my personal experience, which is confirmed by talks with many skippers and by tests and observations, this rule-of-thumb seems to be adequate. If, for instance, the period is longer than that prescribed by the above rule the boat feels unsafe and the stability may be too low. In such cases a careful stability calculation is recommended so that corrective measures may be taken.

The feeling among many fishing-boat operators that boats with high stability, much ballast, and a broad beam are the most stable is understandable. Nevertheless it is incorrect, as closer study of the problems involved has shown. Captains and operators of bigger vessels than fishing boats recognize these problems ; they have learned the theories in the marine academies. It is important that this knowledge be spread to fishermen and builders of fishing boats.

Many other factors influence seakindliness. The problems are by no means solved, even for bigger vessels, and recent papers (Kent, 1950 ; Weinblum and Denis, 1950) have shown that very much remains to be learned. For instance, there are many problems related to the application of dampening devices, the body shape above the waterline, the minimum freeboard and type of sheer, and those connected with coupled motions. The shape of a boat has an important effect upon its seakindliness, but the arrangement and distribution of weights also have an influence. It is felt that fishing boats with the main weights (such as engines and deckhouses) aft are seakindlier ships than those carrying these weights forward.

Speed

Speed is very important in fishing boats. Sometimes it is felt that fishing boats have larger engines than necessary and that these engines take up valuable space, weigh down the hull, and increase the fuel consumption more than they contribute to a higher speed. But it is not only the size of the engine which determines the boat's speed ; the shape of the hull is also important.

There is seldom time or money enough, after the completion of a fishing boat, to carry out trials to investigate the true speed at different engine loadings. It is therefore difficult to get any reliable data about fishing boat speed ; published data from trials and tests made at time of delivery are often exaggerated. Usually, only the maximum speed is measured, but very seldom are enough tests made to permit the plotting of a full power curve, and seldom are such tests reported in the literature. Complete and reliable trials take time. They must be carried out on a measured mile, and runs must be made in both directions in order to compensate for the influence of current and wind. They can be especially valuable if the fuel consumption is also measured.

Fig. 1, page 2, shows results from such trials with the *Half'sh*, Canadian wooden dragger (Hines and Traung, 1951). Data on this boat are given in Table 2. One curve shows fuel consumption per hour, the other how many nautical miles the boat can sail with a certain amount of fuel at different speeds. The curves show clearly that the consumption does not increase proportionately with the speed but at a much faster rate. At 8.5 knots the boat can travel 1.24 miles per 10 liters of fuel but at 9.36 knots, at 10 percent higher speed, it can only travel 0.89 mile per 10 liters. The distance at 8.5 knots on the same fuel is about 40 percent longer. Fuel consumption is an indication of how many horsepower the engine develops and hence the actual engine power can be calculated from fuel measurement . This is called the brake horsepower (BHP).

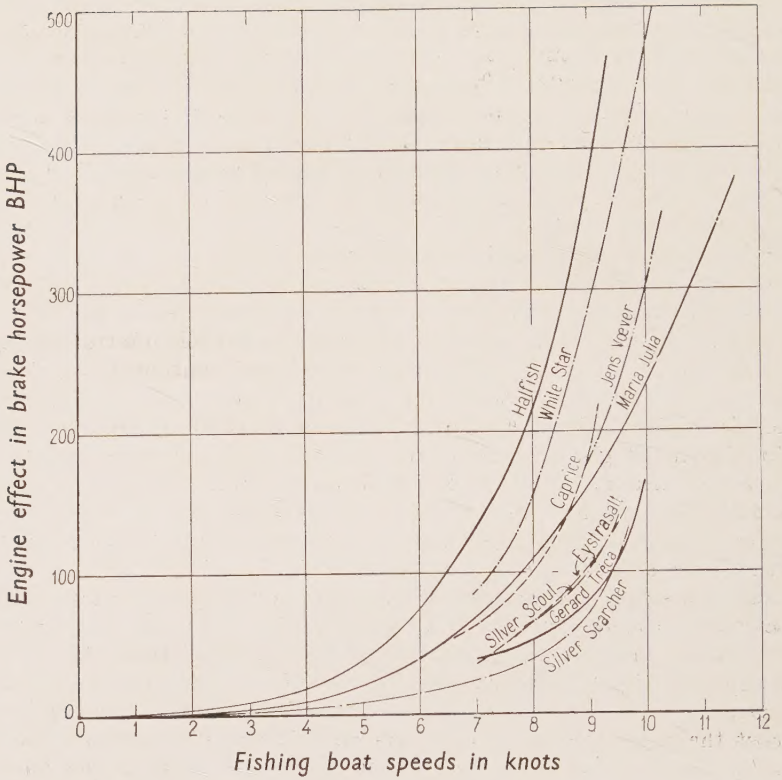
Fig. 2, page 10, shows curves of the necessary BHP for the fishing boat types in Table 2. The curves represent measurements from actual trials of the boats at different speeds. Some of the BHP's have been determined with the help of fuel measurements, others with the help of exhaust gas-temperature readings, or similar simpler methods. It would be desirable to use the more accurate torsion or thrust measurements which are used in the testing of big vessels, but they are difficult to carry out on fishing boats. The curves show better than single figures how quickly the necessary BHP increases at higher speeds. These curves indicate that every boat has a speed above which an increase in the engine power is uneconomical. They also answer the question why refitting a boat with a larger engine seldom results in the expected higher speed, but only in more fuel consumption and less cargo room. The *Silver Scout* and the *Silver Searcher* are boats of almost the same size and type. The same is true of the *Caprice* and the *Eystrasalt*. The differences in the power curves show the effect of different hull shapes. This results in a corresponding difference in fuel consumption and running expense.

Careful trial tests are highly recommended for all kinds of fishing boats because they indicate to designers, builders, and owners the maximum output of the engine, whether alteration of the hull shape has been good or bad, and whether the propeller is suitable. The power curve from the test can indicate to the operator the boat's most economical sailing speed and, if posted in the steering house, it can be a daily reminder to the skipper.

There has always been a search for hull shapes which give less resistance and make higher speeds economical. Basic research to find better hull shapes began about 80 years ago, when Froude formulated the method of testing small models in a basin and, from the results, computed the necessary power for ships of different sizes. Froude's model laws can also be used to translate the resistance from one boat to another of the same shape.

By using Froude's model laws, full-scale trials as well as model tests can be translated into nondimensional form in order to compare

Fig. 2



Brake horsepower for various fishing boat types obtained from full-scale trials. (For main dimensions, of the various boats see Table 2, page 6.)

boats of different sizes. With nondimensional compilation it is possible to draw conclusions from the trial of one boat which will apply to another. So, in the long run, carefully made full-scale trials are very worthwhile.

Testing the model of a projected boat in a model basin makes it possible to learn the qualities of the boat and to compare them with other boats before construction begins. In this way necessary alterations can be made in time. Bold projects can be tried without the risk of building a boat for which tests indicate that the design is not good. The value of model tests is that they teach not only what to do but also what not to do.

Model tests are, however, relatively expensive and time-consuming. The necessary money is seldom available in the fisheries industry. Also,

the time between contracting a boat and the keel-laying is often too short for any research. Nevertheless, it should be kept in mind that a single model test is always a good investment if it is compared with other tests. For boats such as fishing vessels, however, systematic model tests have even greater value. In systematic tests whole "families" of models are tested in order to find the effect of single alterations of a hull. Several basic fishing boat tests already have been made and some have been published in several languages.

Summary of Fishing Boat Model Tests

In *Denmark* the Government began some model tests in the Hamburg tank before World War II. They were, however, interrupted by the hostilities, and have unfortunately not been continued since the war.

In *France*, considerable research was carried out by Gueroult for the Government toward the end of World War II, but so far nothing has been published, except the results from one type which I published in 1948. Dervin (1950) has discussed the problems of hull shape. A private French yard made fishing boat tests in the Swedish tank after World War II.

In *Germany*, shortly after World War 1, Schaffran (1921-1922) tested several steam drifters and trawlers. In 1928 Kloess published tests with a Maier-form trawler. In 1941 Graff and Heckscher published results from tests of three steam trawlers. In the same year Heckscher published tests with 22-meter (72-ft.) motor draggers and Brühl the results from a similar type with Maier-form. Since World War II the Germans have not been permitted to make model tests, but several papers by Beeck, Boie, Heckscher, Henschke, Kempᵉ, Kloess, Süberkrüb, and Sprengel have dealt with previous tests and general problems in connection with fishing boat design.

Iceland rebuilt its fishing fleet after World War II and carried out some tank tests in Sweden which I described in 1948. The research trawler *Mari ı Julia* (Table 2, Fig. 2, Traung 1950) is an indirect result of this testing.

Furthermore, most of Iceland's new British-built supertrawlers are the product of extensive tank testing in Britain.

In *Italy*, two manufactures of fishing boat engines have made model tests in Rome with 19.7- and 14.5-meter (64.5-ft. and 47.5-ft.) fishing boat types. The results have been published in catalogues and pamphlets since World War II.

In *Japan*, the Government Fisheries Agency published (Tagaki 1950) curves showing the results of a systematic series of tank tests of 48 models, from which it is possible to make synthetic model tests with boats of similar shape. The test boats had a fixed longitudinal center of buoyancy and a counter stern, and the influence of different

length-displacement, beam-depth ratios, and the prismatic coefficient were investigated. A paper by Nakamura is said to be forthcoming and to describe how to select the optimal hull form with the help of the curves.

In the tank at Wageningen, *Netherlands*, many tests have been made with fishing boats and related ship types (van Lammeren 1948). Jaeger (1949) has given a summary of fishing boat tank tests made by a commission for the reconstruction and development of the Dutch fishing fleet. A book by Roorda dealing with such boats is in preparation.

In *Norway*, the Directorate of Fisheries has made tests with 40- 60- 100- and 130-foot (12.?, 18.3, 30.5, 39.6 m.) fishing boats in the Trondheim tank since the end of the war, but so far only general descriptions of the tests have been given in papers by Vedeler (1948) and Sund (1950). Trawlers for U.S.S.R. have also been tested for a private Swedish yard.

In *Spain*, several fishing boat types have been tested in the tank at Madrid for private companies, and a report is to be published. Llanos (1949) has discussed some of the hull shape problems.

In *Sweden*, the late Palmquist conducted some Government-sponsored fishing boat tests in 1940. The results were published by Nordström (1942 and 1943). The writer has continued Palmquist's tests and published a few papers on them (1948,1949). In the Göteborg tank, private tests with Finnish, French, Polish, and Russian fishing boat types have also been made, and in 1950 I tested a Pacific-type purse seiner for Colombia.

In the *United Kingdom*, the Herring Industry Board tested seven different models of steam drifters and four different motor drifters in 1937. In 1945 the Board made further tests of four models of motor drifters. Some of the results have been published in papers by Edward and Todd (1938) and by Allan (1950). During the war, the British Admiralty tested 75- and 90-foot (22.9 and 27.4 m.) fishing vessels, and the results were reported by Holt (1946). Some of the British shipyards specializing in trawler construction, such as Cochrane, Lewis, Dunston, and Cook, Welton & Gemmel, have made their own model tests in order to improve their own designs, and so far one report is available. It was made by Cunningham (1949) on some of Lewis' tests. The British Shipbuilding Research Association in 1950 set up a committee to co-ordinate British tank tests of trawlers.

In the *United States of America*, Nickum has tested a 77-foot (23.5 m.) purse seiner and a 350-ton tuna clipper, *White Star* (Table 2, Fig. 2). He has also tested a series of four related 150-foot (45.7 m.) tuna clippers in the tank at Ann Arbor, Michigan, where two 95-foot (29 m).) purse seiner models of Hansen, Seattle, and Baier, Ann Arbor, designs have also been tested. The last tests were sponsored by General Motors Corporation, which also has tested a 50-foot (15.2 m.) shrimp trawler and a 100-foot (30.5 m.) Boston trawler, both of double-

chine design. In his Master's thesis Thiel (1948) describes tests at Ann Arbor of a series of nine 100-foot (30.5 m.) trawlers with "V" bottoms. Trammell has tested for his company, the National Steel and Shipbuilding Corporation, two models of 120-foot (36.6 m.) tuna clippers in the Berkeley Ship Towing Tank at the University of California. The Experimental Towing Tank at Stevens Institute of Technology in Hoboken, New Jersey, has carried out a considerable amount of basic research on smaller ships and has published a systematic series of model ships (Murray and Barklie, 1945), a continuation of Taylor's widely used standard series test results (1943) for computing ship's resistance for bigger vessels. The proportions have been chosen so that some fishing boat types also are covered. Steele (1950) has begun some tests with Gloucester draggers with an outdoor test rig and Nevitt is planning to set up a series of tests at the tank of Webb's Institute of Naval Architecture that will cover such ve sels as trawlers.

This summary is by no means complete. Many fishing boat tests made for private companies have not been published. The summary shows, however, that much already has been done, even though the importance of model tests has not been generally recognized. Principally, all these tests have been based on fishing boat designs which have been carefully selected as representative of the particular country. Those designs have then been altered in different ways; a study of the reported tests shows that average improvements have been made to the extent of 20 to 30 percent less fuel consumption or a correspondingly higher steaming speed over boats which already were considered good. Poor designs have been improved much more.

These single tests are helpful if compared on a nondimensional basis. As long as the results can be translated from a model to a boat, they can be translated from one boat to another and from one tank to another.

Practical Example of Tank-testing Experiments and Their Results

This writer made an investigation with a grant from the Mrs. Martina Lundgren Fund for Naval Architectural Research at the Swedish State Shipbuilding Experimental Tank to determine whether the common Swedish fishing boat type, used mainly for trawling and Danish seining, could be improved without sacrificing seakindliness, quality for fishing, or convenience of arrangement. Three models were used in the experiments and every model was altered several times in order to study the effect of single alterations. The ships were tested in several displacements corresponding to (*a*) light ship (*b*) ship "ready to go to sea" with full bunkers and ice and (*c*) ship homebound with cargo. The following results are taken from tests in the "ready to go

TABLE 3. — RESULTS OF TANK-TESTING EXPERIMENTS ON SELECTED MODELS

Model group	250			258					340		
Model No.....	250	250 *a*	250 *b*	*a*	*b*	*c*	*d*	*e*	*a*	*b*	*c*
Characteristic	Original	Sharpened forebody		Long cruiser stern	Transom stern	Fishing boat stern	Fishing boat stem	Fuller stern	Proposal	Somewhat narrower	Big midship section
Length waterline (in m.)..	19.47	19.47	19.47	19.51	19.33	18.73	19.31	19.47	19.51	19.54	19.38
Beam waterline (in m.)....	6.15	6.15	6.15	5.96	5.96	5.96	5.96	5.94	6.27	6.17	6.27
Mean draft (in m.)	2.34	2.34	2.34	2.2	2.2	2.2	2.2	2.16	2.35	2.37	2.29
Prismatic coefficient.....	.671	.661	.638	.572	.572	.584	.585	.593	.569	.575	.550
Center buoyancy (%).....	±0	−1.1	−1.4	±0	+0.28	−0.97	−2.35	−3.55	−3.58	−3.30	−3.25
Half entrance angle in degrees.....	36	33	28.4	28.5	28.5	28.5	24	23.8	22	22	22
Knots	Expected brake horsepower (BHP)										
8	95.2	94.1	86.8	63.4	71.6	78.4	81.4	78.4	83.8	83.8	90.8
8.5	131	128.4	117.2	81.4	89.6	98.4	103.6	98	106.4	104.5	117.6
9	172.4	168.4	152.6	107.4	114.2	129.2	135.8	127.8	134.8	134.5	156.4
9.5	220.4	219.0	201.8	146.6	155.8	180.4	183.2	174.4	184.4	184.8	214.8
10	285.8	286.6	264.4	210.8	223.6	266	261.6	249.8	266.4	268.0	—
	Index										
8	100	99	91	67	75	82	86	83	88	88	95
8.5	100	98	90	62	68	75	79	73	81	80	90
9	100	98	88	62	66	75	79	74	78	78	91
9.5	100	99	91	66	71	82	83	79	84	84	97
10	100	100	93	76	82	93	92	87	93	94	—

to sea " condition, which was done with a displacement of 115 m^3 (corresponding to 118 tons).

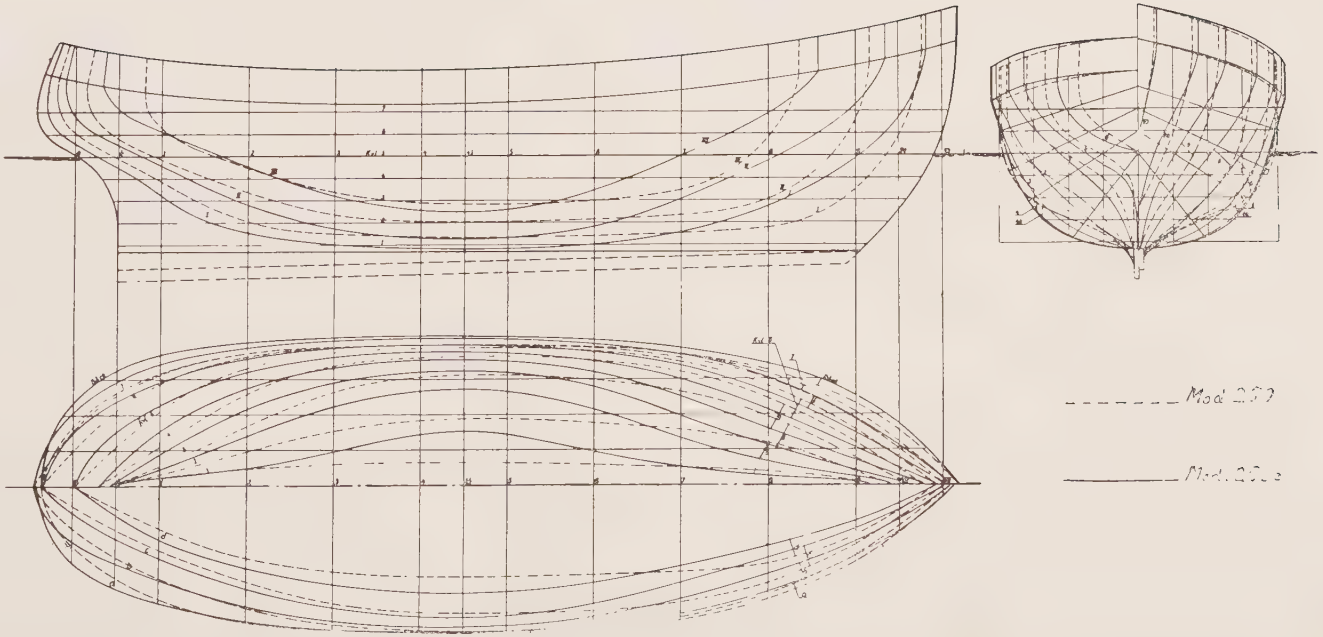
First a design was chosen of a 68-foot (20.7 m.) boat, considered good by many fishermen. The boat was carefully tested in full-scale trials. The stability and the datum waterline, and thus the displacement or hull weight, were investigated. Then a model, designated 250, was made and tested in the tank at Göteborg. The results were compared with the full-scale tests and were in full agreement. The model 250 can be studied in Figures 3 and 4 and the engine horsepower in Table 3. In order to study the effect of sharpening the forebody, the model was sharpened twice. The half waterline angle was first 36°, then 33°, and finally 28.4°. The biggest sharpening in the datum waterline on each side was 0.1 m. (4 in.) the first time and then 0.2 m. (8 in.) or a total sharpening of 0.3 m. (12 in.). The resistance decreased, as can be seen in Table 3, which means that fuel consumption will be lower or the speed higher. This table also gives a kind of index for the resistance, with the values for the original model set at 100.

Some tests had been made for another purpose with a model of an icebreaker tugboat, called 258a, which had shown especially good nondimensional values. The boat had a long overhanging cruiser stern, which made the model somewhat longer than the 250 model. The resistance appears in Table 3. It was decided to try to adopt this type as a fishing boat. The long cruiser stern would not be suitable for fishing so it was simply cut away and the stern was finished with a transom, the transverse section of which was " V " shaped as in the cruiser stern, and the model now was called 258b. The resistance increased somewhat. Then the stern was sharpened to a cruiser stern, as similar as possible to the stern of fishing boat model 250, and called 258c. The resistance increased considerably as can be seen from the table. The next step was to replace the sloping icebreaker stem with a stem profile similar to the fishing boat model. This caused a slightly higher resistance.

The altered tugboat model now had the same profile, beam, and displacement as the fishing boat model, but the resistance was lower. With the transom stern, however, it should be still lower, especially in the loaded condition, and it was decided to investigate whether a fuller cruiser stern would be better than the fishing boat shape. The stern was made as full as construction in wood would allow, and the model was called 258e. The lines of this model can be studied in Figures 3 and 5. In the light condition, the result was a considerable improvement but, surprisingly, the fuller cruiser stern was still better than the sharper one in the loaded condition. The result was a boat with much lower resistance than the original fishing boat model, as can be seen in Table 3. At 9 knots the resistance was 26 percent less in the "ready to go to sea " condition and 29 percent less in the loaded condition.

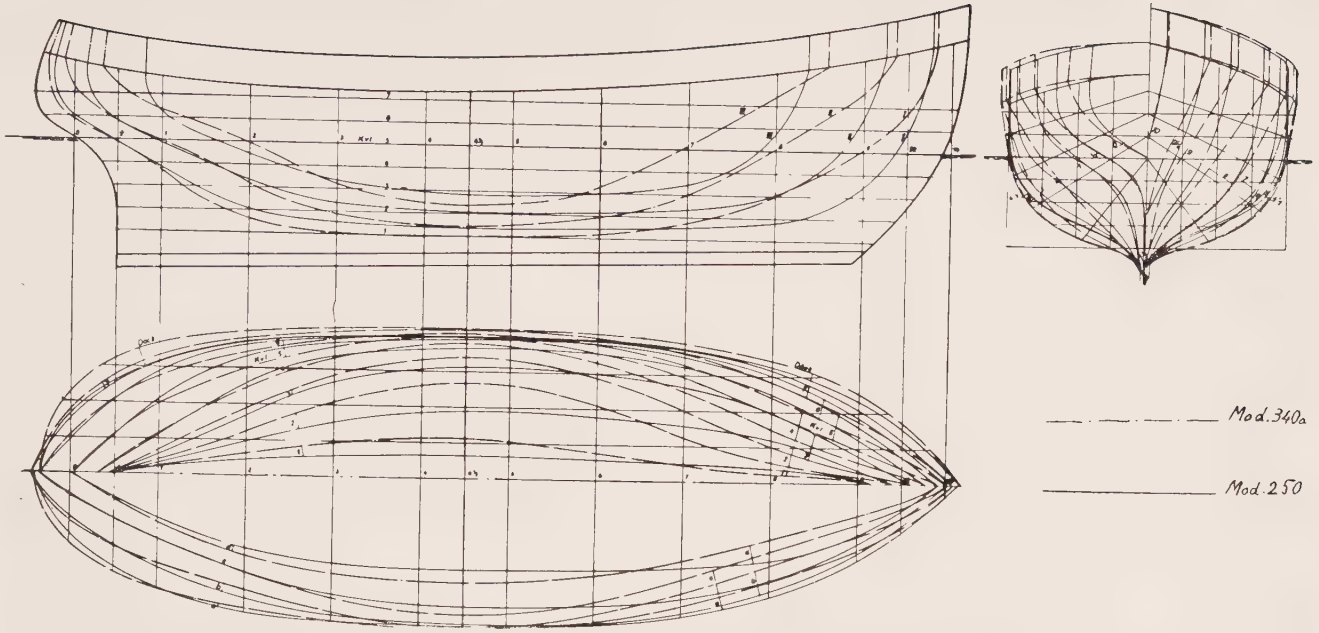
The " tugboat " model 258e is 0.21 m. (8 in.) narrower at the da-

Fig. 3



Lines drawings of two tested fishing boat models. Model 250 is a typical Swedish 68-foot (20.7 m.) boat for trawling and Danish seining. Model 258e is a modified tugboat. Both models have the same profiles, waterline lengths, displacements, and inside volumes of the hull (gross tonnage under deck). Model 258e is slightly narrower in the waterline but beamier in the deck, has a sharper entrance, and fuller midshipsection and run. At 9 knots, the resistance of Model 258e is 26 percent less in the "ready to go to sea" condition and 29 percent less in the loaded condition.

Fig. 4



Lines drawings of two tested fishing boat models. Model 250 is a typical Swedish 68-foot (20.7 m.) boat for trawling and Danish seining. Model 340a was proposed according to results obtained from tests of Model 258e. Model 340a is beamier in both waterline and deck but has the same profile, displacement, and gross tonnage under deck as Model 250. The resistance is 22 percent less in the "ready to go to sea" condition and 18 percent less in the loaded condition.

tum waterline but broader on deck than the fishing boat model 250 and does not have the same deadrise, which to some extent might have been the reason for the lower resistance. The model was not fitted with a wooden keel like the 250. In order to give an absolutely fair comparison, a new model was made, called 340a, the lines of which are shown in Figures 4 and 5. This was 0.12 m. (5 in.) broader at the waterline than 250, but had the same profile and displacement, as well as the same deadrise which Swedish fishermen like. The resistance can be studied in Table 3. Even if the resistance is not so low as for model 258e it is still 22 percent lower than the original model at the 9 knots speed in "ready to go to sea" condition and 18 percent lower in the loaded condition.

Tests were also made to study the effect of decreasing the beam to exactly the same as model 250, but the results did not change.

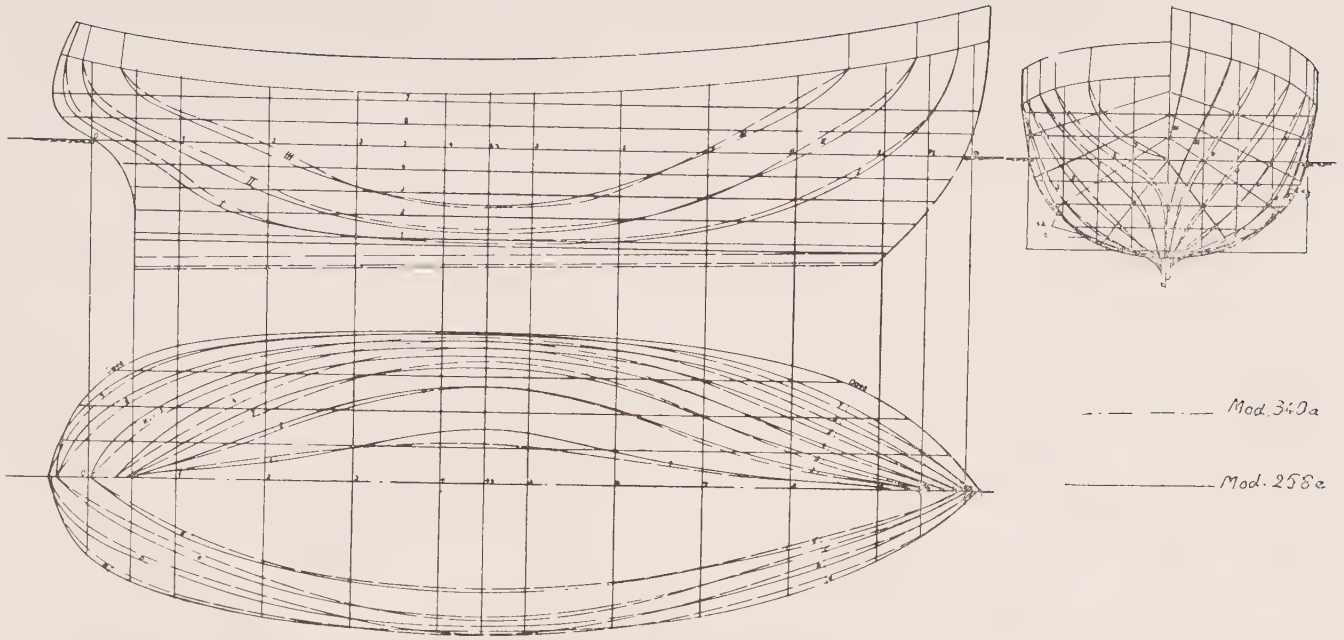
Both models 258e and 340a, compared with the original, 250, have a sharper foreship, a bigger midship section, and a fuller run. The volumes remain the same in all three models. The improvement, therefore, was due to this change in shape, resulting in the different distribution of the displacement. Technically expressed, the models had a lower prismatic coefficient. Tests were also made to find whether a still larger midship section, which means a still lower prismatic coefficient, could be of some benefit. The performance was unsatisfactory; the resistance went up to about that of model 250. The lesson learned was that there is a limit to how big the midship section can be made.

These models were only towed for investigation of their resistance, and the expected towrope horsepower was calculated according to Froude's method. The models can also be tested by using their own propellers, in order to study the interaction between hull and propeller. They can be tested in artificially made waves to determine seakindliness, loss of speed in waves, and maneuverability. The effect figures in Table 3 are given in BHP, which means the effect required of the engine, with an assumed total propulsive efficiency of 50 percent.

Drawings which show the different steps in the alterations of the 3 model "families" 250, 258, and 340 are in the files of the FAO Fisheries Division. Photoprints of these drawings will be sent on request.

These tests are just one series of many. They give only one indication as to how model tests can be made and how one can benefit from them. It must be remembered that a model test in itself is by no means a guarantee that the tested hull shape is good. The object of model tests is only to determine as exactly as possible the required engine power. By comparing these tests with others on a nondimensional basis, or by extensive testing with alterations of different details in the hull shape, one might be able to judge a specific design. A study of the available material on model tests with fishing boats brings out several aspects which may seem hard to believe, but they are in full accord with the laws of naval architecture. The following paragraphs give an account of lessons learned from such experiments.

Fig. 5



Line drawings of two tested improved models of fishing boats. Model 340a is much beamier in the waterline than Model 258e and has the same deadrise as Model 250. Profiles, displacements, and gross tonnage under deck are the same. At 9 knots Model 258e has 5 percent less resistance in the "ready to go to sea" condition and 13 percent less resistance in the loaded condition than Model 340a which, however, for other reasons is considered better for fishing purposes.

General Experience from Model Tests with Fishing Boats

Length. The floating length greatly affects the necessary power to maintain a certain speed. If the hull weight is kept constant and the boat lengthened, the necessary power always decreases in the speed range used by fishing boats. It is, however, seldom possible to build a boat longer without increasing the hull weight. The scantlings must be heavier and more material is needed for the construction, and often the boats must be beamier or deeper. But, even with such amendments, the necessary power often decreases. For example, a well-designed fishing boat, which is 20 m. (65.5 ft.) long in the waterline, has a 6.05-m. (20-ft.) beam and weighs 120 tons, requires 205 BHP to make 10 knots. Another well-designed boat 25 m. (82 ft.) in the waterline with 6.5 m. (21.3 ft.) beam and 194 tons weight requires 190 BHP to make the same 10 knots. Not until the boat is longer than 30 m. (98 ft.), with 6.8 m. (22.3 ft.) beam and 288 tons weight does it require more than 205 BHP to make 10 knots.

The explanation for this phenomenon is that longer boats travel at slower relative speed than shorter boats in spite of the fact that the actual speed in knots is the same. If the 20-m. (65.5 ft.) fishing boat runs at 10 knots, this is the same relative speed as about 40 knots for a big Atlantic liner. The relative speed for the 25-m. (82-ft.) and the 30-m. (98-ft.) boats corresponds to 36 and 33 knots for Atlantic liners. It is obvious that it is cheaper per mile to propel a liner at 33 knots than at 40 knots. Liners do not make such high speeds. Therefore, it is also obvious that the design of a fishing boat hull shape is as important as that of a liner. This, however, is seldom recognized. In the middle of the 19th Century the Englishman Froude formulated the theory regarding relative speed. This is expressed in the formula

$$\frac{\text{Speed}}{\sqrt{\text{Floating length of the ship}}}$$

The result can be expressed in different units, or in nondimensional terms and is popularly called *Froude's number.*

The optimum hull shape differs for various Froude's numbers, which means that a boat should be designed to the actual Froude's number in which it will sail, and not to the absolute speed in knots. This is why the hull shape of a 30-knot Atlantic liner differs from a 30-knot speed-boat.

Fishing boats in general use have heavy bodies and very powerful engines. It would be very hard to increase the speed of this type of boat by making only minor alterations of the hull shape. Here the length is the limiting factor. Lengthening the boat will make it sail at a higher absolute speed in knots, but will keep it sailing in the same Froude's number. Another way to increase the speed would

be to use quite different hull shapes and possibly hulls of extremely light weight construction. However, it is important to point out that even if the speed of recent fishing boats cannot be increased greatly, much can be done with minor alterations of the shape to make the boat sail with considerably less resistance and accordingly better economy at the original speed.

Next to length, the *displacement* or the hull weight has a great influence on the resistance. A loaded boat is always slower than a light one ; a boat with heavy scantlings, heavy engine, or much ballast ha comparatively higher resistance. Length and hull weight are generally more or less fixed for the designer. He cannot do too much to alter these dimensions to get a speedier boat. When calculating nondimensionally the resistance for a given boat, the influence of length and weight are usually eliminated. If two boats are compared and it is stated that one of them is so and so much better, fair comparison is not possible except on the basis that length and weight are the same.

Hull Shape. The improvement of a hull shape requires a change in several of its proportions, but in some of the basic research only one proportion has been altered, so that the effect of a single alteration can be tested. Some of the experience gained, which can be of value to fishing boat owners and builders, is reviewed here.

In general, a broader boat gives higher resistance, but fishermen need beamy boats with sufficient stability and a roomy working deck. Where boats have been planned with the help of tank tests, it has often been possible to design broader boats with less resistance than the original design by alteration of some other proportions.

Among fishing boat owners there is a widespread opinion that a fishing boat hull should have a "cod head and a mackerel tail ;" others express the same thoughts by stating that a hull should have "a good business end to stick into the sea" (Spanner, 1947). However, many tests in calm as well as rough seas have shown that the sharper the entrance angle of the boat, the sharper is the forebody, and the lower is the resistance in both calm water and in waves (Edward and Todd, 1938 ; Allan, 1950). This is valid for the relative speeds at which fishing boats sail ; for other ship types the conditions may be different.

Center of Buoyancy. The hull has a center of buoyancy ; its location, fore or aft of amidship, is a good indication as to whether the boat has its main body fore or aft. For bigger ships the optimum location of the center of buoyancy has been carefully studied and it has been found that the most suitable location for a merchant vessel with high relative speeds should be about 3 percent of the whole waterline leng'h aft of the midship section. I have studied several fishing boat tank tests with regard to this problem and found that the center of buoyancy in most circumstances can be still further aft for this type of craft in order to give the least resistance.

This is especially advantageous for fishing boats with the engine aft, for then they do not need to carry ballast forward to trim down the boat to balance these weights.

To my knowledge, systematic tests of different locations of the center of buoyancy for fishing boats have never been published. I have studied the influence by testing models of a given weight but with different trims, that is, the drafts of the stem and the stern were altered. This caused both the entrance and run angles of the waterlines to differ, but it has been possible, to some extent, to see that an aft position of the center of buoyancy at the higher relative speeds always gives less resistance. Without alterations of the model it has been possible in this way to get a kind of a "model family," and many valuable improvements have been made in the definitive designs with the help of this testing technique.

In model testing it is strongly recommended to test the models with different trims. This makes it possible to arrive at a better judgment of the correct location of the center of buoyancy, and is not so expensive.

Block Coefficient. In connection with merchant vessels, much is said about the block coefficient. This is the ratio of the immersed volume of the hull in the water to the product of waterline length, beam, and the boat's medium draft. It is said to give a measurement of fineness. Merchant ships usually have large block coefficients, while fishing boats in general have lower ones, mostly under 0.55. In my opinion, any variation in block coefficients under 0.55 has no appreciable influence on the total resistance of fishing boats.

Prismatic Coefficient. A much better indicator to express the fineness of a hull shape is the so-called prismatic (cylinder or longitudinal) coefficient. This is the ratio of the volume of the displacement to the product of the waterline length and the area of the midship section. This coefficient eliminates the effect of the different kinds of midship sections. The prismatic coefficient indicates very well whether a boat has sharp ends and a full midship section or vice versa, and is a good measurement of the distribution of displacement. In Taylor's basic model series (1943), completed by Murray and Barklie (1945), the prismatic coefficient is used as the main parameter. Tagaki (1950) has used it in his systematic fishing boat series. The prismatic coefficient has an important effect upon the resistance, and its influence should be considered by every fishing boat designer. I think that fisheries administrators should investigate whether the values of this coefficient on local types of boats are near optimum value. Fishing boats in general have too high prismatic coefficients, mostly over 0.6, often more than 0.65 and sometimes even more than 0.70. As an example, the necessary engine power, calculated according to Takagi, for a 20-m. (65.5-ft.) boat of 120-ton weight with 0.70 prismatic coefficient and 10 knots speed is 342 BHP, for 0.65 pris-

matic coefficient 292 BHP, for 0.60 coefficient 270 BHP. Lowest resistance appears at 0.575 prismatic coefficient, where the necessary engine power is 265 BHP. This means that the boat with a 0.7 coefficient requires 29 percent more engine power to make the same speed. It is felt that the optimum prismatic coefficient is around 0.575 but even lower values may, under certain circumstances, give better results. This depends, however, on other proportions, for example that the boat is not too beamy or too heavy. The prismatic coefficient, the center of buoyancy, and the angle of entrance are in close correlation; it is clear that a boat with a small prismatic coefficient must also have a small angle of entrance. Most of the improvements in fishing vessel design which have been verified by tank tests have depended on the choice of a more suitable prismatic coefficient.

Stern Shape. Many fishing boats have a transom stern, that is a flat, abrupt ending of the aft body so often used ins maller motorboats. It has been felt by many designers that such a transom stern for fishing boats gives higher resistance than a cruiser stern even though the latter is more advantageous for high-speed boats such as motorboats and warships. The transom stern is mainly used in fishing boats because construction is inexpensive and because it provides an ample working deck aft. The experiences gained from the model-family 258, previously described, show, however, that a transom stern can be beneficial even for fishing boats. The research by Thiel (1948) leads to the same general conclusion but much remains to be investigated to get the best speed and qualities of seakindliness. Research on this question is badly needed to find the most suitable shape and size of transom sterns.

"V" Bottom. Most fishing boats are built with a round bottom; some native boats, and even bigger boats, such as shrimp trawlers in the United States of America, are built with a "V" bottom. A "V"-bottom hull has straight frames with one or more chines or edges. In such construction, framing, planking, and the interior work is simple and cheap. There is a widespread opinion that "V"-bottom hulls give much more resistance and cannot be as seakindly as the common round-bottom hulls. In the United States, extensive tank tests have been carried out with "V"-bottom hulls for fishing boats (General Motors, Thiel, 1948). These tests — and the experience with "V"-bottom military and merchant marine vessels, such as 176-foot (53.6-m.) Army FS vessels, 100-foot (30.5-m.) New York tugboats, British 150-foot (45.7-m.) wartime coasters, and various wartime landing craft — show that with careful designing, the "V"-bottom vessel does not have a higher resistance and yet has as much seakindliness as the round-bottom form. Fishing boat operators have sometimes claimed that "V"-bottom hulls are not as stable as round-bottom ones. A check has shown that the "V"-bottom type has often a shorter

period of roll and accordingly a higher stability. This must be due to the larger waterplane area of a "V"-bottom hull with the same length and beam as a round-bottom hull, and to the fact that the engine usually can be placed deeper. When planning such boats it must be ascertained that they ge the right amount of stability if they are to retain the qualities of seakindliness. Also in this field more research would be desirable, since "V"-bottom hulls are much cheaper to build. The use of this design is especially recommended in coun ries developing a boat-building industry.

Conclusion

It has been shown above that it is of the utmost importance to the fisheries industry that fishing boats be designed so that they will perform as economically and efficiently as possible.

Compared with other sections of the industry, however, little research, study, and governmental support have been given to the design of fishing boats. The lack of technical literature on fishing boat design compared with, for instance, the amo nt of literature related to fish processing, is an indi ation of this fact.

This article has given some examples as to how designs can be improved with great savings in operation and get better performance of the boats. It is to be hoped that fisheries administrators and fishing boat operators will constantly keep in mind all possibilities for improving the fishing boats and ascertain that the best advice is obtained and that boat building programs always take the latest technical development into consideration.

To bring about better use of existing knowledge in this field, an inproved exchange of information is highly desirable. Even if some boat types differ considerably from country to country, such exchange is very useful. It is important to compile and compare as many data as possible, including drawings of fishing boats already built. The data should include the hull weight, ballast, drafts, trial results, and particulars of the general performance. FAO has already compiled some data of this description and has for example reports from 250 tank tests of fishing boat models. FAO is keeping abreast of the developments in different countries and is willing to discuss and exchange information with individual fishing boat designers. It is also willing to study designs submitted by member governments, to suggest improvements, and to advise on further research, tank testing, etc., in order to avoid duplication of work.

And, on account of the large expenses of making tests and research by any one owner or builder, it seems reasonable to suggest that regional fisheries associations, etc. co-operate in the conduct of test programs where boat shapes and requirements are similar, spreading the cost so as not to place too large a burden on any one opera-

tor. It would even be desirable if nearby countries would work together, possibly through regional fisheries councils in this field.

JAN-OLOF TRAUNG

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TECHNOLOGICAL ADVANCES IN FISH HANDLING AND PROCESSING

A Summary of Information Reported to FAO in 1950 by Various Member Governments

Africa

British West Africa. In the Gold Coast, experimental canning of the two principal species of fish has been continued, and commercial development is now contemplated.

America

Canada. Experiments were continued on the development and use of mechanically refrigerated railway cars, but technical and economic difficulties still stand in the way of wide-spread utilization of this type of transport. Trucking of fish increased, and air transport, while of limited extent, continues as a special form of development.

United States of America. New products on the market in appreciable volume include frozen breaded shrimp and other breaded items, film bags of salted mackerel in brine and of oysters in their own liquor, canned and frozen fish frankfurters (smoked sausages), canned fish for baby food, and dietetic tuna.

Puerto Rico. Limited refrigeration facilities in distribution channels have in the past greatly hindered the growth of the fresh fish trade. Great progress has been made in recent years, however. The entrance of the wholesalers into the field of production has helped to improve handling methods of fresh fish.

Asia

Ceylon. Four new ice plants with refrigerated rooms have been erected in various fishing districts.

India. More than half of the marine fish catch is still salt-cured or sun-dried, mostly in government fish-curing yards, of which there are more than one hundred. It is hoped that with the resumption

of the supply of salt at reduced concessional rates at the yards, which rates had been abolished in 1947, the quantity and quality of cured fish will show considerable improvement.

Supply of ice has been increased in some parts of the country, but in others it is still scarce. The number of cold storage plants, mostly of multipurpose type, has also been increased. For quick transport of fish in fresh condition from distant fishing centers, four motor vans are now plying in Madras City and Ellore. It is proposed to install ice factories with cold storage facilities at Mangalore, Kozhi-Kode and Tanur on the West coast and at Adirampatnam on the East coast.

Japan. Although marketing conditions have improved as a result of the increase in cold storage capacities and improvement in transportation facilities, minor transportation (e.g., transportation by truck from producing areas in Choshi to Tokyo market, or in hauling from market in consuming areas to retail shops) has not improved so remarkably as railway transportation. The marine products distribution facilities in consuming areas are still far from satisfactory from a hygienic viewpoint.

Oceania

Australia. For the first time in the history of Australian fisheries, tuna, mainly Southern bluefin tuna (*Thunnus maccoyii*), were canned in considerable quantities by the canneries of Narooma and Eden. The fish were caught by trolling with improvised gear and averaged 18 lb. (8 kg.). Several catches of Jack mackerel (scad) (*Tr. churus novae-zelandiae*) were obtained by purse-seine nets, but owing to the unsatisfactory product yielded by this fish when canned, the canneries in New South Wales were forced to refuse further supplies.

A group of Victorian fishermen, using ring nets and special lights, have developed the fishery for anchovies and pilchards in Port Phillip Bay. The catch is used in the manufacture of fish paste. The production of frozen crayfish tails, mainly for the United States market, has increased considerably, particularly in Western Australia.

Whaling operations have recommenced in Western Australia after a break of 20 years, and 190 whales were processed during 1949.

The pearl shell industry is showing great prosperity particularly in the Thursday Island area.

Ice-making plants have been established at a number of fishermen co-operative depots.

Netherlands New Guinea. Since livestock farming is insignificant and can hardly be extended at short notice, the protein for the nutrition of the population has to be derived mainly from fish. It is therefore extremely important that although both production and consumption are already considerable, the fishing industry is still open to

extension. In order to stimulate fisheries, especially sea fisheries, a research station has been established for this purpose at Sorong, and a similar station is under construction at Hollandia. The establishment of more fisheries research stations is being considered. These stations, which will practice fishing in a scientific way, contribute towards the nutrition of the population and also collect scientific data, which can later be disseminated among the population. In addition, these stations will conduct research into export possibilities.

Territory of Papua and New Guinea. Several food preservation specialists spent three months in the territory, studying native methods of fishing and fish preservation in various localities.

Philippines. A fisheries technology building which will house a pilot canning plant and fish laboratory for the demonstration of the different methods of preserving fish is being constructed. The Bureau of Fisheries has carried out a number of studies on salted and smoked fish, fish pastes and fish sausage, seaweeds, the chemical composition of market fish, and the oil content and vitamin A potency of their livers.

Europe

Denmark. The catch of cod of the fishing vessels from the Western Greenland fishing grounds has been taken to Denmark salted and frozen, either round or filleted. It is intended to continue the Greenland fishery in the coming years, and plants are being built ashore for salting, freezing, and other treatment of the catch. The fish canning industry and the producers of fillets have increased their production and export over previous years.

Finland. About 2.5 million kilograms (5.5 million lb.) Baltic herring were dried as surplus and used as feeding stuff. The production of fish meal is now semimechanized and will later be completely mechanized. When the new refrigeration plants are completed, fish can be frozen and sold in the spring as food. At present, surplus dried fish have to be disposed of as feed in the spring.

Netherlands. Among improvements in the oyster industry was the building of frostproof storehouses for oysters.

Norway. There has been very great activity in the building of new processing plants for fish, especially in the war-devastated areas in the Far North ; good progress has been made in the building of cooling and refrigeration plants, all-purpose plants, and herring meal factories. Experiments on storage methods of herring intended for herring meal and oil are progressing satisfactorily.

Ernest Hess

HAITIAN FISH CULTURE PROJECT

Haiti's population per arable acre is one of the highest in the world. The need for more food, especially animal protein, is acute.

The United Nations Mission to Haiti, in which FAO participated, recommended the initiation and encouragement of fish culture in ponds, estuaries, swamps, lagoons, irrigation canals, etc., thus putting into use latent food growing media and utilizing extensive unused swamp and lowland areas. In this way the peasants who cannot afford to buy most other animal proteins could have a means of producing it for themselves by methods that are within their competence and at low capital expense.

Pond fish have been successfully and profitably cultured in relatively small bodies of water or ponds in many countries, notably those of the Far East. Yields of one or more tons per acre per year are by no means infrequent. Boglands, swamps, ravines, etc., can be utilized for fish ponds. Hence this operation does not compete with agricultural land. Also, the waters of irrigation canals and reservoirs can serve a second use as a medium for raising fish, and the waters of flooded rice paddies can be used to raise a crop of fish as well as rice during the rice growing season. All these practices have been tried and found effective. They have not yet been utilized in the Caribbean area.

The extensive bog and lowland swamp areas can be made productive if properly prepared to raise fish. Pond culture of fish does not require the large capital expenditures needed to expand marine fisheries. Fish are esteemed as food by Haitians and would serve admirably towards a more balanced diet. Raising fish would help to provide simple productive employment for the people and would fit admirably into the economy.

On request of the Haitian Goverment, S.Y. Lin, an FAO fish culture specialist, went to Haiti to map out a realistic program. This venture was initially supported jointly by the UN, FAO, and the Haitian Government, and subsequently by FAO and the Government. Under the above sponsorship a program suited to the needs of the country was worked out.

The Haitian Government appropriated 10,000 dollars in 1950 and assigned two government technologists and a number of lay persons to initiate the program. Areas for nursery ponds and for

demonstration and experimental ponds were set aside on grounds of the government experimental farm at Damien. One joint government and private fish culture project has been initiated at Damien and at least two others are contemplated. With assistance from other governmental agencies, notably SCIPA (Service coopératif inter-américain de production agricole), pond construction was started in January 1951.

FAO, under its regular program, does not have the resources necessary to assign a full-time fish culture expert to this project. Fortunately, funds from the FAO Expanded Technical Assistance Program have been made available in time to give this technical assistance the necessary strength and continuity.

On 21 December 1950 a supplementary Technical Assistance Agreement was signed by FAO and Haiti. This agreement provided that a full-time fish culture specialist be supplied for a minimum period of one year to supervise and develop the project. It also provided for a fellowship of six months duration for the senior Haitian officier assigned to the project to study fish culture practices for three months each in the United States of America (Alabama) and probably in Indonesia where such practices are well advanced.

A further supplementary agreement is visualized as the program develops. This would include the services of an experienced practical fish farmer and the provision of a second fellowship for a junior candidate to study fish culture for one year in Indonesia or Japan.

An attempt is being made to gear the speed of the development of the program to the ability of the people to absorb it.

The fish culture project is entirely a Haitian Government project, with only the stimulus and the technical skills being supplied by FAO and FAO/TA. The project has always received the full co-operation and enthusiastic support of the government officials. Two key trained Haitian technicians (zoologists) have been initially assigned to the program. Others will be assigned as the program develops. The ponds at the experimental farm at Damien are designed for demonstration purposes as well as for rearing fish fry for private and public ponds. Farmer interest is being created by including fish culture demonstrations with the regular farm extension program now being initiated.

Although the initial effort in developing fish culture is being carried out in Haiti, the experience gained here would serve for the whole Caribbean and Central American areas. The Haitian project is really a pilot project for this whole area.

J. L. Kask

GROWTH OF THE FISHERIES OF BOMBAY, INDIA

The mechanization of the fishing fleet of the Province of Bombay started in 1934 when a small boat equipped with a 9 horsepower engine was put into use. Since then, there has been considerable development in this direction. Today there are 54 powered boats in operation, the largest of them being 112 feet (34.14 m.) long and equipped with a 500 horsepower Diesel engine.

With the mechanization of the fishing fleet has come an increase in the catch, as shown in the following table.[1]

Year	No. of launches	Weight of fish	
		Lb.	*Metric tons* *
1933/34.....	2	55,520	25
1934/35.....	2	166,125	75
1935/36.....	3	239,446	109
1936/37.....	3	404,679	184
1937/38.....	4	517,964	235
1938/39.....	9	1,576,682	716
1939/40.....	9	2,504,000	1,136
1940/41.....	9	2,264,000	1,027
1941/42.....	10	2,724,000	1,236
1942/43.....	8	2,834,000	1,285
1943/44.....	9	1,154,000	523
1944/45.....	11	1,218,000	552
1945/46.....	15	3,004,341	1,363
1946/47.....	23	3,086,425	1,400
1947/48.....	30	3,500,000	1,588
1948/49.....	50	6,316,828	2,865

* Converted by FAO Fisheries Division

The practices of fish curing and icing have also increased. The Fisheries Department of the Government of Bombay is helping their development by giving loans and subsidies for the improvement of curing yards and construction of ice and cold storage facilities. The department is now building one ice and cold storage plant in Bombay City and has plans for others in several districts of the province. Today there are 34 curing establishments along the coast of the province, and cured fish have an important role in the diet of the hinterland

[1] S. B. Setna, *First Chandra Kala Hora Memorial Lecture. Growth of the fishing industry : Sidelights on fifteen years' work.* Reprint from the Proceedings of the National Institute of Sciences of India, Vol. 16, No. 4, 1950, pp. 207-219.

population. Before the war the daily output of ice was 300 tons; today it has been increased to 700 tons.

Other industries have developed. Among them is the shark-liver oil industry which was started during the war and today has an output of 5,000 gallons (23,000 liters) yearly, fulfilling the domestic demand and leaving an export surplus. Fish glue, gelatine, and fish meal are also being manufactured on a commercial scale.

The Fisheries Department is carrying on a comprehensive program for fisheries development. Docks and market facilities are being improved. The fishermen are being encouraged to form co-operative societies to conduct their trade self-sufficiently and independently of the middlemen. There are now 48 co-operative societies in the whole province, with a central one — the Bombay Provincial Fishermen's Co-operative Association — in the city of Bombay. Loans and subsidies have been granted to the co-operatives or individual fishermen to help in the acquisition of necessary fishing equipment. Through government loans and subsidies new types of boats have been built for the fishermen.

Research and education have an important place in the development program. A technological and a marine biological laboratory have been built, and an aquarium with facilities for research is now completed. Fishery schools for the education of fishermen's children are being organized, and ten schools are now in operation. [2]

Although the amount of fish available has increased, there remains a great demand to be fulfilled. The Government of India, private initiative, and the provincial government are attacking this problem. A deep-sea fishing station has been established at Bombay City by the Government of India; it has been operating a trawler since 1948. The quantity of fish landed by this vessel during the last two years is about 292,000 pounds (130 m. tons).

The fishermen of the Province of Bombay are responding with great energy to the government effort to develop the fishing industry, and former sleeping coastal villages are today thriving fishing communities.

Horacio Rosa, Jr.

[2] Government of Bombay, Directorate of Publicity, *Backward Classes, Fisheries and Rehabilitation,* Bombay Marches On, No. 4, Bombay, India, 1950.

THE MEDITERRANEAN FISHERIES COUNCIL

The agreement reached at Rome in September 1949 for the organization of a General Fisheries Council for the Mediterranean Sea has now been accepted by three governments, Italy, United Kingdom, and Egypt. The agreement will enter into force when five governments have accepted it.

The delegates to the Rome meeting set up two interim technical committees, one on Oceanography and one on Technology, to draw up a technical program for the inaugural meeting of the Council and to draft suggestions for future Council activities. The FAO Regional Fisheries Officer in Europe, Mr. M.J. Girard, was designated interim secretary. The members of the two committees appointed by the governments are as follows :

	Oceanography	*Technology*
1. France	Jean Le Gall	Jean Le Gall
2. Greece	Nicholas Speranzas	Cristos Serbetis
3. Italy	Roberto Almagia Gustavo Brunelli Francesco Vercelli Carlo Maldura	Gustavo Brunelli Carlo Maldura Gabriella Cannici Giacometti Giulio Bonamico Michele Trova
4. Yugoslavia	Tonko Šoljan	Berislav Parać Ante Domancić
5. Lebanon	Edmond Donato	Edmond Donato
6. United Kingdom	C. F. Hickling	

No formal meeting of the committee members has yet been called, although ideas have been exchanged through the secretary.

Dates for the inaugural meeting will be set as soon as five governments will have accepted the agreement.

J.L.K.

Conferences and Meetings

International Commission for the Northwest Atlantic Fisheries

The first meeting of the *International Commission for the Northwest Atlantic Fisheries* was held in Washington D.C., 2-10 April 1951. The Commission, in accordance with the terms of the International Convention for the Northwest Atlantic Fisheries which was opened for signature at the meeting held in Washington in January-February 1949, provides machinery for international co-ordination of scientific investigation and conservation of the fisheries resources of the waters off the West Coast of Greenland, the East Coast of Canada and the New England States of the United States of America. Its work is concerned with fish of the cod group, the flatfish, and the rosefish or Sebastes.

Though the Commission may engage directly in scientific investigations such as it finds necessary to produce information upon which conservation measures may be based, for the time being it relies upon the efforts of its individual member governments which conduct their investigations nationally, the function of the Commission in this regard being to plan and co-ordinate this national effort. The Commission has no direct regulatory powers but it may make recommendations to its respective member governments regarding such measures which, on the basis of scientific evidence, it considers necessary for the maintenance of a sustained yield of the above-named fish in the Convention area. In order to facilitate its work, the Convention area is divided into five subareas, each of which is the concern of a panel made up of member governments which have an interest in that particular subarea. Each panel is presided over by a chairman who is appointed for two years and who is charged with the duty of carrying out the objectives of the Convention.

It is the duty of the panels to keep under review the fisheries of their subarea and consider relevant scientific information which is yielded by the co-ordinated national effort. On the basis of such information, they may make recommendations to the Commission itself concerning any regulation deemed necessary and in turn the Commission passes these recommendations on, if they are approved, to the respective member governments of the panel. On the acceptance of such suggested regulations by all the governments constituting the panel, it becomes binding on all governments party to the Convention.

The Convention became effective on 3 July 1950 after the ratification of four signatory governments had been received. These were Canada, Iceland, United Kingdom, and United States of America. Denmark ratified the Convention on 14 December 1950. It is the hope of the Commission that the Governments of France, Italy, Norway, Portugal, and Spain, which were signatory, will ratify the Convention in the near future.

This first meeting was primarily of an organizational nature. Dr. Hilary J. Deason of the United States and Mr. A.T.A. Dobson of the United Kingdom were elected Chairman and Vice-Chairman respectively and will hold office for two years as provided for in the Convention. Rules of procedure were adopted, panels formed, and Standing Committees on Finance and Administration and Research and Statistics were constituted. The Chairmen of these Standing Committees are Mr. J. Howard MacKichan of Canada and Dr. A. W. H. Needler of Canada, respectively.

With regard to the site of the Commission's Headquarters, the Convention provides that it must be somewhere in North America, and it was unanimously decided that it should be in Canada. Invitations were received from : the Provincial Government of Newfoundland, Canada, which offered a site in St. John's ; Dalhousie University in Halifax, Nova Scotia, Canada ; and Harvard University in Cambridge, Massachusetts, United States. However, a final decision was not taken as to the permanent site and the offer of the Government of Canada to house the Commission temporarily in the Biological Station of St. Andrew's, New Brunswick, was accepted. The Canadian Government also agreed to second Dr. William Robert Martin, Biologist, St. Andrew's Biological Station, to be acting Executive Secretary during the period of 1 July 1951 to 30 June 1952. Mr. Richard S. Wheeler of the U.S. Department of State will carry out the duties of Executive Secretary until Dr. Martin assumes office.

It was decided that the second meeting of the Commission would take place in St. Andrew's, New Brunswick, in June 1952.

Having disposed of the organizational phases of the meeting, considerable discussion on the relationship with other international bodies, particularly the Food and Agriculture Organization of the United Nations and the International Council for the Exploration of the Sea, took place. During these discussions, Dr. D. B. Finn, acting for the Director-General of FAO, made the following statement :

" The concept of wise utilization and maintenance of the sustained yield of a fishery is part of the FAO objective. Indeed we have given expression to this in the formation of Regional Fisheries Councils in certain parts of the world. Originally it was our intention to seek the creation of such a Council for the Northwest Atlantic, but since certain FAO member nations felt that this objective might best be implemented by the establishment of another international body, namely the Northwest Atlantic Fisheries Commission, we have allo-

cated the money which was to be used for a Northwest Atlantic Council to other parts of our work.

"If circumstances should at any time be conducive to bringing the Northwest Atlantic Fisheries Commission within the framework of FAO, under Article X, paragraph 2 of the Convention, FAO would welcome such a development and be prepared to undertake the responsibilities involved, as the necessary financial resources become available either out of FAO's regular budget or from contributions from the interested countries. Such a development would be in keeping with the repeated recommendations of the FAO Conference that new technical organizations should not be created and that existing international agencies should be fully utilized to carry out the work for which they have been established.

"Pending such development, FAO would be happy to render to the Northwest Atlantic Fisheries Commission all active assistance and co-operation that is financially possible. Since financial restrictions have made it necessary for us to limit our programs, this co-operation must of necessity be limited to consultation and advice. It is felt that this might be valuable particularly in the field of production statistics in which we have gained considerable experience."

The following resolution was adopted by the Commission.

"WHEREAS, Article X, Paragraph 1, of the International Convention for the Northwest Atlantic Fisheries provides that the Commission shall seek to establish and maintain working arrangements with other public international organizations which have related objectives, particularly the Food and Agriculture Organization of the United Nations and the International Council for the Exploration of the Sea, to ensure effective collaboration and co-ordination with respect to their work and, in the case of the International Council for the Exploration of the Sea, the avoidance of duplication of scientific investigations;

"WHEREAS, the Northwest Atlantic Fisheries Commission desires that there be realized, at the earliest practicable date, the mutual advantages to be gained from such co-operative working arrangements;

"AND WHEREAS, it is regarded as necessary that, before the establishment of such working arrangements, there be specific examination of the precise areas of common interest which may provide a basis for co-operation, and of methods and means for implementing the said Article X, paragraph 1;

"NOW, THEREFORE, BE IT RESOLVED, that the Chairman and Executive Secretary of the Northwest Atlantic Fisheries Commission are instructed to consult with appropriate officials of other public international organizations with related objectives, particularly the Food and Agriculture Organization of the United Nations and the Interna-

tional Council for the Exploration of the Sea, with a view to determining the related aspects of their respective functions, and programs ;

"And be it further resolved, that the Chairman and the Executive Secretary are authorized to enter into such interim arrangements for exchange of information, and other forms of co-operation, as may be expedient, and that the Chairman shall report to the Commission at its Second Annual Meeting concerning actions taken pursuant to this resolution, and shall recommend to the Commission the most practicable and effective methods by which co-operative working relationships between the Commission and such organizations may be established and maintained."

It is hoped that action upon this resolution will be mutually beneficial and that the overlapping of work and duplication of effort will be avoided. In the meantime, the Director-General of FAO has communicated his willingness to use his good offices with the signatory nations which have not yet ratified the Agreement and who are all members of the Food and Agriculture Organization of the United Nations, with respect to securing certain of the statistical information which is desired by the Commission.

D. B. F.

Comité permanent international de la conserve

The *Comité international permanent de la conserve* (*CIPC*) is having its first half-yearly conference for this year, 24-26 May 1951, at 3 rue de Logelbach, Paris, France. The agenda includes a report on the work of the Scientific Committee; discussions on standardization of cans, including certain cans for fish ; and labeling of cans containing tuna and similar species, or anchovies and similar species. The definition of the terms "canned fish," and "canned fish in oil" will be included in discussions on regulations and definitions of sterilized and semisterilized canned foods. Other points on the agenda are discussions on statistics, organization of labor in canneries, amendments to the constitution of the Committee, and arrangements for the Second International Congress on Canned Foods.

M. J.

Second International Congress on Canned Foods

The *Second International Congress on Canned Foods* will be held in Paris, 16-19 October 1951, under the auspices of the Comité international permanent de la conserve (CIPC). Papers will cover nutritive aspects of canned food, reports on recent technical developments in canning, and

a discussion of legislative and scientific problems. One day will be devoted to the development of metal containers and their standardization. The CIPC will hold a meeting immediately before and after the general session of the convention. Inquiries regarding the convention should be directed to the Secretary of CIPC, Mr. P. Peissi, 3 rue de Logelbach, Paris 17e, France.

M. J.

Eighth International Congress of Refrigeration

The *Eighth International Congress of Refrigeration* will be held in Church House, Westminster, London, 29 August - 11 September 1951, under the auspices of the International Institute of Refrigeration. Presidents of the Congress will be the Chairman of the FAO Council, Viscount Bruce of Melbourne, and Prof. W. J. de Haas. The first week of the Congress will be devoted to the reading of technical papers and discussions. The second week will be devoted mainly to industrial visits. A meeting of the Technical Board of the International Institute of Refrigeration will be held during the Conference. Inquiries should be addressed to the Secretary, Eighth International Congress of Refrigeration, Dalmeny House, Monument Street, London E.C. 3, England.

M. J.

Fisheries Division Activities

Fisheries Problems Discussed at the Second Latin-American Regional Meeting on Food and Agricultural Programs and Outlook

The Second Latin-American Regional Meeting on Food and Agricultural Programs and Outlook was held in Montevideo, Uruguay, simultaneously with the Fourth Inter-American Conference on Agriculture, 1-12 December 1950. Delegations were sent to the meeting by Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, France, Guatemala, Haiti, Mexico, Netherlands, Nicaragua, Panama, Paraguay, Uruguay, the United States of America, and the United Kingdom. Argentina and Canada were represented by observers. In addition, several organizations were invited to participate in the discussions, and delegations were sent by the Pan-American Statistical Institute, Inter-American Indian Institute, International American Institute for the Protection of Childhood, United Nations organization, World Health Organization, United Nations Educational, Scientific and Cultural Organization, International Labour Office, Economic Commission for Latin America, International Refugee Organization, the Holy See, Inter-American Council of Trade and Production, and the International Federation of Agricultural Producers.

At the FAO meeting, problems confronting the Latin-American fishing industries were discussed from a regional point of view for the first time in an inter-American conference. The FAO Fisheries Officer for Latin America, Dr. B.F. Osorio-Tafall, presented a paper on behalf of the Fisheries Division. The document, entitled "Better Utilization of Fisheries Resources in Latin America" dealt with the following subjects: Importance of fish in Latin-American diet; known resources in the region; Latin America's share in world fisheries production; present developments; imports to and exports from the region; latent possibilities; development problems, including what some countries have accomplished; matters related to fishermen, their various organizational forms and special problems in financing fishery enterprises; markets (domestic, within the region, and in other regions) and the outlook for Latin-American fisheries.

The Uruguayan delegation presented three papers. One suggested close co-operation among Latin-American countries for the better knowledge and use of their fisheries resources and co-ordination of programs and standardization of research methods through the facilities of a Latin-American Fisheries Council. Another recommended

that FAO, through its Fisheries Division, draw up general standards that can be used by Latin-American countries as a guide in establishing sound sanitary regulations for fish commodities. A third paper emphasized the necessity for basic research as well as the need for establishing marine biological laboratories to carry out oceanographic investigations. A paper on Survey of the Humboldt and El Niño Currents was presented by delegates from Ecuador and Chile.

The regional meeting noted with satisfaction the action taken by the Food and Agriculture Organization in the establishment of Regional Fisheries Councils in parts of the world not served by such bodies, and further noted the preparatory work undertaken by its Fisheries Division with fisheries administrators and scientists of the several Latin-American countries towards determining the mutuality of interests of these several countries in the development and rational utilization of their fisheries resources. The Uruguayan delegation moved and the representatives from Chile and Ecuador seconded a motion, which was unanimously approved, recommending that, in continuation of that work, the Director-General of the Food and Agriculture Organization be requested to invite member governments in Latin America to nominate appropriate delegations to meet in some Latin-American capital, as early as is feasible in 1951, for the purpose of formulating a draft agreement for submission to their several governments and to FAO for the establishment of a Latin-American Fisheries Council. It was further recommended that the national delegates to the preparatory meeting be chosen from among technicians and specialists, and that the objectives of the Latin-American Fisheries Council should include oceanographic, meteorologic, and fishery biologic studies in the waters surrounding Latin America.

A resolution was passed urging that FAO take steps to find a way to promote international co-operation and to establish somewhere on the Pacific Coast of South America a research center to study the Peruvian Coastal Current and El Niño Current. To this end cooperation should be sought from several scientific agencies, such as the Inter-American Geodetic Institute, the Inter-American Tropical Tuna Commission, etc., as well as those governments which would benefit directly or indirectly from this work.

The meeting endorsed a proposal of the Uruguayan delegation for the establishment of a Fisheries Training Center, to be operated under the FAO Technical Assistance program for a period not exceeding three months, for the purpose of training officials in various activities of fisheries and related industries. This course will be restricted to a limited number of students and will cover three fields : Biology, designed to establish the scientific basis for the survey, appraisal, and management of the living aquatic resources of economic importance to Latin America ; Technology, dedicated to the adequate utilization of marine products in the best economic conditions ; and Economics, concerning sound economic principles on which fisheries

utilization should be based, including compilation and analysis of accurate statistics. If acceptable to Chile, it was felt that the Training Center might well function at the Technical University of Valparaiso during the early months of 1952.

Assistance to Member Governments

The following brief description of the work performed in Thailand during the latter half of 1950 by fisheries officers attached to the FAO Regional Office for Asia and the Far East is a good indication of the kind of assistance which can be extended to FAO member countries needing guidance in the development of their fisheries.

Assistance was given Thai fisheries workers in the carrying out of pond culture experiments, with special attention to the development of pond culture work in the Bangkhen Fisheries Station. Another phase of the work of FAO fisheries officers was the preparation of instructions on the carrying out of biological studies on Thailand's oysters and experiments in oyster culture, as well as the preparation of "Simple Methods for Oyster Culture," a popular account which was printed in Thai by the Government and distributed to fisheries workers and officers. The regional FAO fisheries officers also helped in preparing instructions for Thai workers on how to conduct studies leading to the development of milkfish and other brackish-water fish culture, in planning a survey of milkfish fry and fingerling producing grounds and experiments on methods of collection. Assistance was given in the training of fisheries officers through the supervision of specific projects, consultation and discussions, and field trips. In addition, a planned course was carried out at the Bangkhen Fisheries Station during September, October, and November 1950.

FAO attaches a great deal of importance to the training of fisheries officers and it is planned that this aspect of its work will be emphasized through the Expanded Technical Assistance Program.

An example of specific projects which might be of interest to several countries, particularly in the Far East, is the pilot statistical study carried out in the fishing community of Paknam as the first stage of a full-scale socioeconomic study of Thai fisheries.

Assistance was also given to Thailand in connection with the preparation of requests for aid under the United Nations Expanded Technical Assistance Program. The FAO regional fisheries officers have similarly assisted several countries, not only in Asia and the Far East, but in the other areas where officers are located.

Other Activities

Mr. Jan-Olof Traung of the Technological Branch visited Mexico, 31 December 1950 to 19 January 1951, to study boatbuilding activi-

ties and the types of fishing boats in use there. He rendered assistance and technical advice to the Office of Industrial Investigations of the Bank of Mexico (Banco de Mexico), as well as to various shipyards and fishing boat owners, with regard to shipbuilding methods and principles involved in the construction of fishing boats.

At the request of the Governme t of the Province of Nova Scotia, Canada, Mr. Traung consulted in Boston, 13-15 December 1950, with a representative of the Nova Scotian Fisheries Department and a naval architect who acts as consultant for the provincial government, regarding the construction of a new fishing boat which is being considered. In particular, he was able to provide information on exper ence gained in other parts of the world with variable pitch propellers. Mr. Traung visited Halifax, Nova Scotia, 4-7 February 1951 to assist in the conduction of performance tests of a newly-built fishing boat. These tests were carried out to determine speed, fuel consumption, seaworthiness, etc.

At the invitation of the School of Fisheries, Sainte Anne de la Pocatière, Kamouraska, Quebec, Canada, Mr. Mogens Jul of the Technological Branch presented a series of lectures, 14-16 December 1950, for students attending the course in fisheries. The lectures covered storage and transportation of live fish, keeping qualites of fresh fish, structure of frozen fish tissue, canning control, and documentation in fisheries matters. Mr. Jul also gave a speech on FAO's role in the world food problem before a local co-operative society in Sainte Anne. During a period of annual leave from FAO, 22 January - 15 February 1951, Dr. Ernest Hess, also of the Technological Branch, gave a series of lectures and laboratory demonstrations on the canning of fishery products at the School of Fisheries.

Staff Changes

It is with regret that we announce the resignation of Dr. J.L. Kask, Chief of the Biological Branch, and Mr. G.V. Howard, Fisheries Biologist.

Dr. Kask assumed office in January 1948 and was responsible for the organization of the Division's work in its biological aspects. A study of the world's fisheries resources was commenced under his direction, and summaries of the literature showing the resources of the Mediterranean, the Near East, and Latin America have been completed. Dr. Kask played a prominent part in organizing Regional Fisheries Councils; he directed the work on the scientific and common names of the fishes used in commerce; latterly he turned his attention to fish culture as a source of animal protein especially for the less developed densely populated countries. Dr. Kask has accepted an appointment as Chief of the Section of Research and Development, Pacific Oceanic Fisheries Investigations, Honolulu,

T.H. He will be in charge of scientific research and the planning and analysis of results of exploratory fishing operations as a basis for the development of the high seas fisheries resources in the Pacific Ocean around the Hawaiian, Phoenix, and Line Islands and U.S. Trust Territory.

Mr. Howard, who compiled *Fishery Research and Educational Institutions in North and South America* and the resource studies, has joined the Inter-American Tropical Tuna Commission (United States of America and Costa Rica) as Senior Fisheries Biologist in charge of bait research. Headquarters of the Commission are at Scripps Institute of Oceanography, La Jolla, California.

We are pleased to announce the appointment of Mr. Reginald H. Fiedler as Technical Assistance Officer for Fisheries. For the past two years Mr. Fiedler has been Fisheries Specialist with the Economic Cooperation Administration. During that time he came into intimate contact with fisheries problems of the ECA countries in Europe and several of the countries in the Far East. He returned in late December 1950 from the Far East, where he had been on assignments in Korea and Indonesia. From 1944 through 1946 he was Chief of the Fisheries Division of the Supreme Commander for the Allied Powers in Japan. Mr. Fiedler entered the U.S. Fish and Wildlife Service in 1924 and was made Chief of the Division of Fishery Industries in 1929. He remained with the Service until his entrance into the U.S. Army in 1944. Mr. Fiedler is a gradua'e of the School of Fisheries, University of Washington, Seattle, Washington, U.S.A. His training and wealth of experience in the field of fisheries make him eminently qualified for his new task in charge of FAO's work in fisheries under the United Nations Expanded Technical Assistance Program.

Agreements for technical assistance in fisheries have been concluded by FAO with Haiti, Pakistan, Chile, and Ceylon, and negotiations with several other countries are expected to be concluded shortly.

Publications

Scientific and Common Names of Tunas, Mackerels, and Spearfishes, the first progress report on scientific and common names of important food fishes, has been issued in mimeographed form. This work, prepared by Horacio Rosa, Jr. of the Biological Branch and entitled "The Scientific and Common Names Applied to Tunas, Mackerels, and Spearfishes of the World, with Notes on their Geographic Distribution," records the scientific names applied to fishes of these species in various geographic areas and points out that much remains to be done before the relationships and the taxonomy of these important fishes are satisfactorily established. Common names used to denote the species are given in several languages and arranged for quick identification. These fishes are widely distributed in the oceans of the world. The

report contains information on the limits of their distribution, the areas of greatest concentration, and the location of commercial fisheries.

Commodity Standards for Fishery Products, a digest of the laws and regulations in effect in various countries pertaining to the composition and processing of fisheries commodities has recently been completed by Dr. Ernest Hess of the Technological Branch and mimeographed in English. This study contains detailed information regarding such questions as methods of control and inspection, requirements of various countries with regard to labeling and designation of fish names, the net weight required in cans, barrels, etc., standard measures for containners, etc. The summary, which is about 99 pages plus 52 tables, will be sent to member countries of FAO. It is hoped that these countries will study the information given in it and send any corrections or suggestions for additions to the Fisheries Division of FAO. These comments will then be incorporated in the final version of the summary.

The Handbook for World Fisheries Abstracts is now available in French and Spanish. The Handbook contains a general explanation of the use of *World Fisheries Abstracts*, in particular how the abstracts can be cut out and filed. It also contains a list of the publications abstracted, a detailed list of the Universal Decimal Classification System code numbers for subjects in fisheries technology which are used in the abstracts, and an alphabetical subject list which enables users to locate information in their abstract file.

Notes on Films

SILD-GENNEM IS OG ILD (Herring – Icing and Smoking). Producer and distributor : Fiskeriministeriets Forsøgslaboratorium, Øster Volgade 10, Copenhagen K, Denmark. Technical data : 16 mm., black and white, silent, 32 minutes running time, titles in Danish or English. Price : 16 mm. print : with Danish titles, 950 D.Kr. (ca. US$66) ; with English titles, 1200 D.Kr. (ca. US$82) ; rental : free loan arrangements may be made with the distributor.

Shows herring fishing operations off Bornholm Island in the Baltic Sea. Shows the measuring of water temperature by a simple homemade device, the setting of nets at a depth where the temperature is about 13° C. (55° F.), together with animated illustrations of the gill net fishing operation. In describing the smoking of the herring and the preparation of a Buckling-like product, the film shows how the herring is cleaned, washed, and put on smoking spears, and also the construction and operation of the smoking oven. Experiments are shown with various new types of smoking ovens and various methods of icing the fish aboard and ashore. Sequences from a research laboratory show how freshness determinations are made, both by organoleptic and chemical (trimethylamine) methods.

The film is primarily intended to be used to stress the importance of quick and thorough chilling and icing of fish.

M.J.

BASIC NET MENDING. Producer and distributor : Branch of Commercial Fisheries, Fish and Wildlife Service, U.S. Department of the Interior, Washington, D. C. ; and Sundial Films, Inc., New York, N.Y., U.S.A. Technical data : 16 mm., color, sound, about 650 feet, 16 minutes running time, commentary and titles in English. Price : 16 mm. color print : US$78.31, obtainable from Castle Films, Division of United World Films, Inc., 1445 Park Avenue, New York 29, N. Y. , U.S.A. ; rental : free of charge from distributor.

Intended for the instruction of fishermen, shows the tools used in net mending and the various common knots. Instruction in the way knots are cut open and meshes formed are shown step by step in such detail that it should be easy for anyone to learn these operations from the picture.

M.J.

FRESH AS THE DAY IT WAS PICKED. Producer : Carl Dudley Productions. Distributor : Preco Incorporated, 6300 East Slauson Avenue, Los Angeles 22, California, U.S.A. Technical data : 16 mm., color,

sound, 450 feet, 20 minutes running time, commentary and titles in English. Price : 16 mm., color print : US$125.00 ; rental : free.

Primarily intended to show the operation of a special refrigerator car ventilation system manufactured by the distributor of the film. Shows in considerable detail fruit packing and shipping operations. The sequences showing the construction and operation of ordinary refrigerator cars and of those equipped with the ventilation systems, which are partly illustrated by animated diagrams, should be of some interest to audiences principally interested in fisheries.

M. J.

RETAILING FISH. Producer and distributor : Branch of Commercial Fisheries, Fish and Wildlife Service, U.S. Department of the Interior, Washington, D.C. ; and Sundial Films, Inc. ; New York, N.Y., U.S.A. Technical data : 16 mm., color, sound, about 750 feet, 18 minutes running time, commentary and titles in English. Price : 16 mm. color print : US$93.64, obtainable from Castle Films, Division of United World Films, Inc., 1445 Park Avenue, New York 29, N.Y., U.S.A. ; rental : free of charge from distributor.

Intended to give instruction to U.S. fish retailers in the best methods for managing a fish store. Shows in considerable detail the cleaning of the whole store and its equipment and the arranging of fish for display, both in store windows and in display cases inside. Information is also given as to the best methods for storing supplies of fresh and frozen fish. It indicates that it is advantageous to reserve a separate section of the store to the cleaning and dressing of fish. The best methods for dressing and wrapping fresh fish are shown.

M. J.

PACIFIC HALIBUT FISHING. Producer and distributor : Branch of Commercial Fisheries, Fish and Wildlife Service, U.S. Department of the Interior, Washington, D.C., U.S.A. Technical data : 16 mm., color, sound, about 675 feet, 16 minutes running time, commentary and titles in English. Price : 16 mm. color print : US $88.46, obtainable from Castle films, Division of United World Films, Inc., 1445 Park Avenue, New York, U.S.A. ; rental : free of charge from distributor.

Shows how ice is taken aboard a halibut schooner before it leaves for the fishing grounds off the Aleutian Islands, indicates on animated maps the route followed by the boat, shows repair work on machinery and gear being carried out on the way to the grounds, and waste from a salmon cannery being picked up at Kodiak Island, to be used later for baiting the longlines. Then shows the selection of proper fishing grounds by use of an echo sounder ; the setting and hauling of the lines, together with a diagram explaining the various parts of the gear ; stowage of the fish aboard ; and the methods for recovery of the halibut liver and its preservation in metal cans aboard. Gives a very complete description of the whole fishing operation.

M. J.

Notes on Publications

NOTES ON PUBLICATIONS are being presented in a form similar to that used by the FAO *World Fisheries Abstracts* for the convenience of those readers who wish to cut out and interfile the notes with the WFA cards. This will necessitate cutting out the notes, pasting on cards, and perhaps subscribing to a second copy of the Bulletin if all notes are filed. The classification systems and subject headings are the same as in the WFA. An explanation of the classification and subject heading systems, instructions for filing, as well as a detailed list of the Universal Decimal Classification code numbers and an alphabetical list of the subject headings are contained in the *Handbook for World Fisheries Abstracts* which is now available in English, Spanish, and French. It should be noted that the coding system has been modified for technological subjects, but much work remains to be done to modify similarly the economic and biological subject headings and classification numbers.

FWS 9.11 HYDROGRAPHY – DIRECTORIES UDC 06

Emery, K.O., compiler. *An International Directory of Oceanographers - With Special Reference to Marine Geologists.* University of Southern California, Allan Hancock Foundation, Los Angeles, California, U.S.A. iv + 54 pp. In English.
1950

The compilation began as a listing of marine geologists, but was expanded to include physical and chemical oceanographers, meteorologists, and biologists whose work is of particular interest to marine geologists. Names of 750 scientists are listed according to country, title, and field of research. Although fairly complete, there are some omissions, and the author suggests that if sufficient interest is shown, a second edition might be prepared.

G.V.H.

FWS 9.2 FISHERIES STATISTICS UDC 31

Lübbert, Hans. *Die grossen Seefischereien der Erde, ihre Fanggründe und ihre Fangprodukte* (The Great Sea Fisheries of the World, Their Fishing Grounds and Products). Verlag Girardet & Co., Hamburg, Germany. v + 104 pp., 4 maps, 141 tables.
1950

A condensed and limited survey of the catches, according to fishing grounds and commercial species, of most European fisheries countries, namely, United Kingdom, Norway, Germany, Iceland, France, Portugal, Netherlands, Sweden, and Denmark (incl. Faeroes and Greenland), with all figures referring to 1937 catches. For European Russia — Baltic, Caspian, Aral, Black, and Asow Seas — the figures are mostly pre-World

War I, and pre-World War II for the Barents and White Seas. Data for Spain and Italy are also pre-World War II.

For the fisheries of Asia, Japanese data refer mostly to 1933 and 1938 catches ; the fisheries of China and Asiatic Russia are also covered.

The accounts of the North American fisheries of the United States, Canada, and Newfoundland are based mainly on 1937 data.

E.H.

FWS 9.7 FISHERIES EDUCATION — NORWAY UDC 37 (481)

Brobak, Karl, and Myklebust, Bjørn. *Fiskerilaere* (Fisheries Knowledge). 1949 Folkets Brevskole, Torggt. 17, Oslo, Norway. 13 pamphlets totaling 230 pp., 1 app., illus. In Norwegian.

This correspondence school course was published with the assistance of the Norwegian Director of Fisheries. The pamphlets deal with oceanography, general fisheries biology, fishing boats and gear, fishing methods for herring, cod, brisling, sole, eel, whale, etc., and with fisheries technology, including a description of the production of cans, of the salting of fish, freezing, etc.

J.O.T.

FWS 9.7 FISHERIES EDUCATION — NORWAY UDC 37(481)

Vigestad, Odd. *Regnskap for fiskere* (Bookkeeping for Fishermen). Fol-1949 kets Brevskole, Torggt. 17, Oslo, Norway. 10 pamphlets totaling 145 pp., 16 app. In Norwegian.

This is a full bookkeeping correspondence school course especially adapted for fishermen. Methods are given for the different kind of fisheries which are practiced along the Norwegian coast. The principles of depreciation, new purchases, contract writing, statistics, etc., are explained. The course was written in co-operation with the Norwegian Fishermen Association (Norges Fiskarlag).

J.O.T.

FWS 1.0147 FISHERIES STATISTICS UDC 31 (492)

The Netherlands. Ministerie van Landbouw, Visserij en Voedselvoorzien-1950 ing. *Jaarcijfers over de Visserij gedurende het Jaar 1949* (Annual Fisheries Statistics for the Year 1949). Verslagen en Mededelingen van de Directie van de Visserijen No. 40. The Hague, Staatsdrukkerij. 82 pp. In Dutch. Tables in Dutch and English.

This annual survey presents information for 1949 along the same lines as given in the 1948 Report which was listed in *FAO Fisheries Bulletin* Vol. III, No. 4, pp. 91-92, July-August 1950.

L.P.D.G.

FWS 1.0147 FISHERIES STATISTICS UDC 31 (493)

Belgium. Ministerie van Verkeerswezen. Bestuur van het Zeewezen. *Jaarverslag over de Zeevisserij in 1946* (Annual Report on the Sea Fisheries in 1946). Mimeographed. 125 pp. In Flemish.

Contains text and statistics on the activities of the Belgian fishing fleet in 1946 in the various fishing grounds, including coastal waters, the North Sea off Iceland, Ireland, and the coast of Spain. Quantities, values, and prices of landings are given according to fishing grounds. Types of craft, monthly distribution of landings, average landings of important species, the standardized unit of fishing fleet (100 hours of fishing for one developed horsepower) are also given.

L.P.D.G.

FWS 9.2 FISHERIES CO-OPERATIVES UDC 33

Fishermen's Co-operative Federation. *Co-operative Fishermen's Annual,* 1950 *Production Year 1949.* Vancouver, British Columbia, Canada, March, 1950. 44 pp., illus. In English.

The fifth annual report of the Federation to the Board of Directors and a summary review of the general progress made over the past five years, this publication deals with past policies and present problems in matters such as plant and equipment, membership, cannery project, marine insurance.

Comparative statistics and graphs for 1949 and past years on fish production are given, with gross value of sales, investments and capital expenditures.

J.A.

FWS 9.11 OCEAN UDC 551.46

Ommaney, F.D. *El Océano* (The Ocean). Breviarios del Fondo de Cul-1950 tura Económica. Pánuco 63, México D.F. 267 pp., 14 fig., 16 pl. In Spanish.

The Ocean was originally published in English by the Oxford University Press, London, in 1949. This Spanish translation, made by Dr. B. F. Osorio-Tafall, contains more illustrations than the original; the maps have been redrawn for better clarity. The ten chapters are: Oceanic Basins; Life in the Sea; Plankton; The Open Sea; The Seashore; The Continental Shelf; The Depth of the Sea; Marine Fisheries; Whales and Whaling; Equipment and Methods. There are a useful bibliography and three subject indexes.

B.F.O.T.

FWS 9.1 MARINE BIOLOGY UDC 57

MacGinitie, G.E., and MacGinitie, Nettie. *Natural History of Marine*
1949 *Animals.* McGraw-Hill Book Company, Inc., New York, N.Y., U.S.A. xii + 473 pp., 282 fig. In English.

A general account of the ocean as an environment and the natural history of some animals (invertebrate) that live there. Comparisons are made of living conditions on land and in the sea. Also considered are the abundance and availability of food, habits, sense organs, growth rates, evolution, and life histories of typical forms.

G.V.H.

FWS 9.12 BIOLOGY UDC 57

Pearse, A.S. *The Emigration of Animals from the Sea.* The Sherwood
1950 Press, Dryden, New York, U.S.A. ix + 210 pp., 23 fig. In English.

An outgrowth of the author's book *The Migrations of Animals from Sea to Land* published in 1936, this book outlines the origin of life in the sea and compares the ocean, fresh-water, and land environments. One chapter discusses the routes of the migration from the sea to land which take place along the border of the two environments ; others cover the causes of emigrations from the sea and how animals have adapted themselves to the terrestrial environment. There is an extensive bibliography of ecological works.

G.V.H.

FWS 1.2 HERRINGS, ETC. — NORTH ATLANTIC OCEAN UDC 597.5(261)

Fridriksson, Arni, and Aasen, Olav. *The Norwegian-Icelandic Herring*
1950 *Tagging Experiments Report No. 1.* Fiskeridirektoratets Skrifter, Serie Havundersøkelser (Report on Norwegian Fishery and Marine Investigations), Vol. 9, No. 11. Director of Fisheries, Bergen, Norway. 43 pp., 8 fig., 2 app. In English.

An account of the methods and results so far obtained from the Norwegian-Icelandic herring tagging investigations. Preparatory work, initiated in 1947, for the co-operative research between the two countries is described as well as techniques and equipment used at the various tagging localities off the coasts of Norway and Iceland in 1948, 1949, and 1950. Also included is an analysis of the tag returns.

G.V.H

FWS 1.1 TUNAS, MACKERELS, ETC. — WESTERN PACIFIC OCEAN UDC 597.5(266)

United States Department of the Interior, Fish and Wildlife Service. 1950 *Results of Encouragement for the Development of Albacore Fishing Grounds in 1939.* Translated from the Japanese language by W. G. Van Campen. Special Scientific Report - Fisheries No. 33. Washington, D.C., U.S.A. 175 pp., tables, fig. In English.

A translation of material published by the Fisheries Bureau of the Japanese Ministry of Agriculture and Forestry in February 1940 relating to the government's subsidy program designed to develop albacore fishing in the Pacific. Includes information on the areas surveyed, description of the participating vessels and their equipment and gear, extent and results of the cruises of each vessel, fishing methods, oceanographic data collected, and biological studies.

G.V.H.

FWS 1.2 HERRINGS, ETC. — CANADA UDC 597.5(71)

Vladykov, V.D. 1950 *Movements of Quebec Shad* (Alosa sapidissima) *as Demonstrated by Tagging.* Contribution from the Department of Fisheries, No. 30, Province of Quebec, Canada. 19 pp., 4 fig,. 2 tables. In English.

Reports on a tagging experiment conducted from 1945 to 1948 in which 1,855 shad were marked and released in the St. Lawrence River, Quebec. Some subjects treated are : size of Quebec shad, types of tags used, numbers of shad tagged and recovered, movements of Quebec shad, mixing of shad populations in the Atlantic, and homing tendency of shad. Instructions for handling tagged fish and their return to the investigators are also given.

H.R.Jr.

FWS 1.2 HERRINGS, ETC. — AUSTRALIA UDC 597.5(94)

Blackburn, M. 1949 *Age, Rate of Growth, and General Life-History of the Australian Pilchard* (Sardinops neopilchardus) *in New South Wales Waters.* Bulletin No. 242. Commonwealth Scientific and Industrial Research Organization, Melbourne, Victoria, Australia. 86 pp., 8 fig., 8 pl. In English.

Reports on studies of the age and growth of the unexploited pilchards of New South Wales by means of scale readings and analysis of length frequency distributions. Special attention is paid to differences in the appearance of age-rings and to their significance. The general life history is also outlined. The author concludes that in growth rate and life history the species resembles that of the Atlantic coasts of southwestern Europe more than other related species.

G.V.H.

FWS 1.95 WHALES, DOLPHINS, AND PORPOISES UDC 599.5

The Whales Research Institute. *The Scientific Reports of the Whales* 1950 *Research Institute*, No. 3. Tokyo, Japan, February 1950. 190 pp. In English.

Contains 14 papers on the biology and technology of whales including such titles as "On the Sensory Tubercles of Lips and of Oral Cavity in the Sei and Fin Whale," "Properties of Fats and Oils Contained in Various Parts of a Sperm Whale Body," "Statistic Study of Foetuses of Whales."

J.L.K.

FWS 1.95 WHALES, DOLPHINS, AND PORPOISES UDC 599.51

Ruud, Johan T., and Jonsgård, Åge. *Age-studies on Blue Whales Taken* 1950 *in Antarctic Seasons 1945-46, 1946-47 and 1947-48.* Hvalrådets Skrifter Nr. 33 (Scientific Results of Marine Biological Research No. 33). Det Norske Videnskaps – Akademi i Oslo, Oslo, Norway. 72 pp., 14 fig. In English.

Deals with studies on the baleen plates of 1,942 blue whales in the seasons 1945-46, 1946-47, and 1947-48. A description is given of the method of age determination used which is considered reliable up to age-group VI. Results of the analysis indicate females reach sexual maturity at 3 to 7 years, the majority at 5 years. Males mature at 2 to 6 years, the majority being 4 or 5 years. Other information includes mean lengths of the different age groups, rate of growth, accumulation of corpora lutea in the ovaries, changes in size composition of the catch in relation to changes in age composition, and the application of age-distribution in a calculation of the numbers in the various age-groups appearing in the catch.

G.V.H.

FWS 1.95 SEALS, SEA LIONS, AND WALRUSES — CANADA UDC 599.55(71)

Fisher, H.D. *Seals of the Canadian East Coast.* Circular, General Series 1950 No. 18. Fisheries Research Board of Canada, Atlantic Biological Station, St. Andrews, New Brunswick, Canada, September 1950. 4 pp., illus. In English.

Lists the six species of seals found on the East Coast of Canada, giving biological information on the four most common ones namely the harbor seal (*Phoca vitulina*) and gray seal (*Halichoerus grypus*) which are resident species, and the migratory harp seal (*Phoca groenlandica*) and hooded seal (*Cystophora cristata*). Included are descriptions of these species

with data on their distribution, pupping season, as well as notes on life history and general habits. Also included is some information on the commercial fishery for the migratory species and suggestions for the control of the resident species which are of little economic importance and which damage the fisheries.

G.V.H.

FWS 1 FISHERIES INDUSTRIES UDC 639.2

Lebret, L.J., and Sauvée, J. *Pêcheries mondiales et marché du poisson*
1950 (World Fisheries Industries and Markets). Ministère des Finances et des Affaires économiques, Institut national de la statistique et des études économiques, Etudes et Documents série C 3. Presses Universitaires de France, 108 boulevard Saint-Germain, Paris 6e, France. In French.

In this, the first of a two-volume study, the authors present a series of monographs summarizing the fishing industries of the different countries of the world. The production of the major producing countries is analyzed according to personnel, gear used, type of fishing, and fish caught. Each of these documented studies begins with a short historical note. Separate charts and graphs show the evolution of the fishing industry.

J.C.

FWS 1 FISHERIES INDUSTRIES UDC 639.2

Penso, G. *I prodotti della pesca* (Fisheries products). 2nd Ed. Editore
1950 Ulrico Hoepli, Milan, Italy. 478 pp., 325 illus., 25 tables. In Italian.

The first part discusses the role and nutritive values of fisheries products in human nutrition ; the second part deals with the inspection of fish, including the characteristics of fresh and spoiling fish, mollusks, and crustaceans ; with poisonous fishes, and especially fish diseases, in great detail ; with sanitary shellfish control and the spoilage of canned fisheries products. The third and fourth parts cover the preservation of fresh fish by chilling and freezing, and the salting, drying, smoking, and canning, and by-products industries. The last part lists Italian legislation concerning sanitary inspection and the fisheries products industries and trade. There is an extensive bibliography (practically all pre-World War II), and an author and subject index.

E.H.

FWS 1.0147 FISHERIES INDUSTRIES — GERMANY UDC 639.2(43)

Germany. Bundesministerium für Ernährung, Landwirtschaft und Forsten.
1950 *Jahresbericht über die Deutsche Fischerei 1949* (Annual Report on the German Fisheries 1949). Verlag Gebr. Mann, Berlin, Germany, Aug. 1950. 102 pp. In German.

Resumes the series of annual reports on German fisheries. Furnishes statistics for 1949 on the number and types of craft, quantities and values of fish landings by month, harbors, and principal fisheries species. Also contains section on fisheries activities in Western Germany including controls, research, organization of commercial activities, high seas fisheries, lugger fisheries, the small high seas and coastal fisheries of the North and Baltic seas, fish meal and oil industry, and the trade and marketing of fish. A final section surveys the sea fisheries of Northern and Western Europe until 1938, during the war (1940-44) and gives postwar developments. Many of the tables present data not only for 1949 but also for several prewar and postwar years.

L.P.D.G.

FWS 1.0148 FISHERIES INDUSTRIES — FRANCE UDC 639.2(44)

Desmond, Richard C. *Fisheries of France.* Fishery Leaflet 381. Re-
1950 print of American Consulate Report No. 225, Paris, France, February 10, 1950. United States Department of Interior, Fish and Wildlife Service, Washington, D.C., U.S.A., July 1950. Mimeo. 18 pp. In English.

Deals with the problems facing the French fisheries in primary and secondary production. At present, problems of production are considered by the trade to be secondary to the problems of marketing. The report lists as an important factor in the increase of fresh marine fish landings in 1948 and 1949 the prewar reconstruction and modernization of the French fishing fleet. Some statistical tables based on the most recent available national data on various aspects of the fisheries completes and complements the analysis made.

J.A.

FWS 1.0113 FISHERIES INDUSTRIES — U.S.A. UDC 639.2(73)

Fish Commission of Oregon. *Fish Commission Research Briefs.* Vol. 3,
1950 No. 1, September 1950. Portland, Oregon, U.S.A. 49 pp., illus. In English.

Contains five biological research papers and several short information items including studies of the shad (*Alosa sapidissima*) fishery of the Umpqua River, observations on pulp and paper affluents and the effects of such pollutants on the fisheries of the Willamette River, a study of the water supply of a new salmon hatchery on the North Santiam River, an analysis of the salmon catch of the sport fishery, and a description of the soupfin shark fishery (*Galeorhinus zyopterus*) of Oregon.

G.V.H.

FWS 1.013 FISHERIES RESOURCES — ARGENTINA UDC 639.2(82)

Popovici, Zaharia. *Problemas de Hidrobiología y su Vinculación con la Ex-*
1949 *plotación Pesquera* (Hydrobiological Problems and their Relation to Fisheries Exploitation). Instituto Nacional de Investigación de las Ciencias Naturales anexo al Museo Argentino de Ciencias Naturales "Bernardino Rivadavia." Miscelanea No. 2. Ministerio de Educación de la Nación, Subsecretaria de Cultura, Buenos Aires, Argentina. x + 52 pp. In Spanish.

A dissertation on the productivity of the oceans, the abundance of marine organisms, and factors affecting them. Points out the importance of hydrobiological factors in the scientific management of fisheries resources, and suggests a program for the study and regulation of the fisheries of Argentina.

H.R.Jr.

FWS 1.013 FISHERIES INDUSTRIES — VENEZUELA UDC 639.2(87)

Corporación Venezolana de Fomento, Sub-Gerencia Técnica, Departamento
1950 de Pesca. *Programa de Fomento Pesquero* (Fisheries Development Program) (1949-1950). Caracas, Venezuela. 26 pp., 5 pl. In Spanish.

A report on the program for development of the fisheries of Venezuela being carried out by the Venezuelan Development Corporation (Corporación Venezolana de Fomento). Reports on mechanization of the fishing boats, shipyards and shipways, construction of fishing boats, fishing ports, co-operative schools for fishermen, preservation and distribution of fish, fishing companies, ichthyological and oceanographic investigations, details of investment and credits, and future program.

H.R.Jr.

FWS 1.015 FISHERIES INDUSTRIES — INDIA UDC 639.2 (87)

Government of Bombay, Directorate of Publicity. *Backward Classes,*
1950 *Fisheries and Rehabilitation.* Bombay Marches On, No. 4. Bombay, India. 30 pp., illus. In English.

Under the title "Bombay Marches On," a series of booklets containing an account of the work and activities of the Government of Bombay during the period October 1947 to March 1949 is being issued. No. 4 of the series contains information on the fishing industry in Bombay, including development, research, and education.

G.V.H.

FWS 1.017 FISHERIES RESOURCES — AUSTRALIA UDC 639.2(94)

Blackburn, M. and Tubb, J.A. *Measures of Abundance of Certain Pelagic*
1950 *Fish in Some South-Eastern Australian Waters.* Bulletin No. 251. Commonwealth Scientific and Industrial Research Organization, Melbourne, Victoria, Australia. 74 pp., 3 fig., 2 pl., app. In English.

An attempt is made to indicate the general levels of abundance during the principal seasons of the year of the most important non-scombroid pelagic fish in certain waters of southeastern Australia and to demonstrate the stability or instability of these levels from year to year. The work is intended mainly for the information of those who may be interested in exploiting these species, few of which, according to the writers, are adequately used at present. It is based upon results of survey work by the Division of Fisheries of C.S.I.R.O. since 1938.

G.V.H.

FWS 1 FISHERIES RESEARCH UDC 639.2.001.5

Central Fisheries Station of Japan. *Contributions 1946-1948,* Part II
1950 (Contributions Nos. 51-112). Tokaiku Suisan Kenkyujo, Tokyo, Japan. 327 pp. In Japanese with English summaries.

Reports work carried on at the Central Fisheries Station at Tokyo, including studies in fisheries biology and fisheries technology as exemplified by the following 3 titles: "Studies on the stock of Hokkaido herring, I. Yearly catch per trap-net from 1870 to 1946" by T. Kamana; "The chemical constituents of the bone of shark" by T. Takahashi and T. Kikuchi; "Studies on the preservation of fish, Rep. 3, The preservative power of acidified ice" by E. Noguchi and M. Bito.

J.L.K.

FWS 2.11 NAVAL ARCHITECTURE UDC 639.2.06

Allan, James F. *Research on Design of Drifters.* Quarterly Transactions
1950 of the Institution of Naval Architects, London. Paper read before the joint meeting of this Institution, the Institution of Engineers and Shipbuilders in Scotland, and the N.E. Coast Institution of Engineers and Shipbuilders in Newcastle-upon-Tyne, England, on 27 June 1950. Vol. 93, No. 1, p. 56. Jan. 1951. 17 pp., 5 illus., 10 diagrams, 8 tables. In English.

This research indicates how it is possible to modify the design of a drifter with the help of testing models in a shipbuilding tank to obtain speed benefit of about half a knot without sacrificing the seaworthy qualities of the design.

J.O.T.

FWS 1.1047 FISHING BOATS — STATISTICS UDC 639.2.06 (493)

Belgium. Ministère des Communications, Administration de la marine.
Rapport annuel sur l'évolution de la flotte de pêche en 1949 (Annual report on the development of the fisheries fleet in 1949). Mimeographed. 27 pp. In French.

Surveys, in the light of statistical data, the development of the Belgian fisheries fleet in 1949. Data presented cover number of craft, method of propulsion, age of craft and machines broken down by the principal classes and types of craft ; capital investment in the fleet ; and data by the principal fishing harbors. Tables on fishermen and crews according to occupational types and craft groups are given.

L.P.D.G.

FWS 2.118 FACTORY SHIPS UDC 639.2.068

Lochridge, W. "*Fairfree*" - *Fishing Vessel and Floating Factory Develop-*
1950 *ment.* Reprint of Paper No. 1130 from the Transactions of the Institution of Engineers and Shipbuilders in Scotland, Elmbank Crescent, Glasgow. 39 pp., 12 illus., 3 tables. In English.

A general description of the conversion and arrangement of the well-known British factory ship, together with particulars of the freezing installation, the para-otter trawling system with 2 trawl nets, and its operation. A report of the discussion of the paper is included.

J.O.T.

FWS 2.112 FISHING METHODS AND GEAR — DIRECTORIES UDC 639.2.081

United States Department of the Interior, Fish and Wildlife Service. *Partial*
1950 *List of Manufacturers of Fishing Gear and Accessories.* Fishery Leaflet 195. Washington, D.C., U.S.A., revised November 1950. 5 pp. In English.

Lists manufacturers of nets, netting and twine, net making supplies, ropes, wire rope, fish hooks, knives, tongs and rakes, baskets, scallop bags, floats, clothing, trolling equipment, unloading pumps, trawl doors, winches, gill-net lifters, diving equipment, electronic instruments.

J.O.T.

FWS 2.112 FISHING METHODS AND GEAR — U.S.A. UDC 639.2.081 (73)

Coker, Coit M. *Maryland's Commercial Fishing Gears. I. The Fin-fish*
1949 *Gears.* Educational Series No. 18. Maryland Department of Research and Education, Board of Natural Resources, Solomons Island, Maryland, U.S.A., Feb. 1949. 37 pp., 15 fig. In English.

Brief descriptions of the five types of commercial fishing gear : pound net, gill net, fyke net (including eel pot), haul seine, and otter trawl. The purse seine is mentioned, although it is now barred in Maryland. Each type employs a different principle of capture : impoundment, entablement, entrapment (with or without bait), encirclement, and scooping. It further contains a glossary and a list of the names of commercially important fishes in Maryland.

J.O.T.

FWS 2.112 FISHING METHODS AND GEAR — U.S.A. UDC 639.2.081(73)

Plancich, V. A. (Compiler). *Commercial Fishing Supplies.* Sunde & d'Evers Company, Colman Dock, Seattle, Washington, U.S.A. 104 pp., illus. In English.
1949

A catalogue containing summaries of the most important Pacific coast fishing methods : gill netting, halibut fishing, purse seining, shark fishing, crab pot fishing, trap fishing, trawling, trolling, and tuna fishing. Each part is illustrated with very instructive drawings of the boats in action, as well as with figures of the most typical gear used.

J.O.T.

FWS 2.112 FISHING METHODS AND GEAR — PHILIPPINE REPUBLIC UDC 639.2.081 (917)

Umali, Agustin F. *Guide to the Classification of Fishing Gear in the Philippines.* Research Report No. 17. United States Department of the Interior, Fish and Wildlife Service, Washington 25, D.C., U.S.A. 165 pp., illus. In English. Price : US$0.40.
1950

Attempts to standardize the nomenclature for fishing gear used in the Philippines. Gives a basic classification of fishing gear (non-textile and textile devices) ; a key to the identification of classes of fishing gear ; definitions of classes of fishing gear ; 53 drawings illustrating various types of fishing gear used in the Philippines ; an alphabetical classification of Philippine gear with vernacular and dialect names (28 pp.) and a 66-page alphabetical glossary of Philippine fishing gear terms. There is a bibliography of 42 titles.

E.H.

FWS 1.2 FISHERIES INDUSTRIES - HERRINGS, ETC. — MENHADEN UDC 639.222.8

Miles, D. W., and Simmons, E.G. *The Menhaden Fishery.* Bulletin No. 30, Marine Laboratory Series No. 11. Texas Game, Fish and Oyster Commission, Austin, Texas, U.S.A. 28 pp., 5 fig. In English.
1950

Gives information on the menhaden industry, in general, and on the menhaden industry of Texas, in particular, presented under 16 headings, including history of the fishery, use as food, uses of menhaden oil, economic importance, nets, and effects of menhaden operations on other fisheries.

H.R.Jr.

FWS 1,1 FISHERIES INDUSTRIES — TUNAS, MACKERELS, ETC. UDC 639.227.4

Staats, William R. Co. 1949 *The Tuna Fishing and Packing Industry of California.* (Second Printing) William R. Staats Co., June 28, 1949. 29 pp., illus., tables. In English.

Describes briefly the various aspects of the tuna fishing and packing industry of California including the history of the industry, the various species commercially classified as tuna, distribution of tunas throughout the world, types of craft used in tuna fishing in California, methods of contracting with boat owners and compensating the fishing crews, fishing methods, packing plant operations, sales, advertising, prices, and other commercial features. It includes statistical and graphical data on tuna landings, quantities of tuna and similar species canned in California, tuna prices per ton as paid to fishermen, wholesale price for various types and grades of canned tuna.

L.P.D.G.

FWS 1.95 WHALING UDC 639.245.1

International Commission on Whaling. 1950 *First Report of the Commission.* Covering the first fiscal year 1 June 1949 to 31 May 1950. Office of the Commission, London, England. In English.

Lists the members of the International Commission on Whaling (constituted under the International Whaling Convention signed at Washington on 2 December 1946), gives the chronology of origin of the Commission and a summary of its early activities. There are also eight appendices which include the convention itself, the rules of procedure, and such items as amendments to schedules, agenda of meetings, and accounting of expenditures.

J.L.K.

FWS 9.16 FISH CULTURE UDC 639.3

Indian Council of Agricultural Research. 1950 *Madras Rural Piscicultural Scheme.* Progress Report (Period : 1st April 1949 to 31st March 1950). Madras, India. 64 pp., tables, 17 app. In English.

Includes four sections covering the studies being carried within the piscicultural scheme at the Fresh-water Biological Station of the Government Fisheries, Madras, and general observations on fishes, acclimatization, and

transport of live fish, studies on fish diseases, parasites, enemies and mortality, manuring and feeding experiments, observations on the spawning of carps, limnological and rheological investigation, hydrobiology of local water, etc. Previous contributions in this series are listed.

H.R.Jr

FWS 9.17 FISHERIES MANAGEMENT UDC 639.3

United States Department of the Interior, Fish and Wildlife Service, Branch
1950 of Fishery Biology. *Doctoral Dissertations on the Management and Ecology of Fisheries.* Special Scientific Report - Fisheries No. 31. Washington, D.C., U.S.A., July 1950. 35 pp. In English.

A list of nearly 350 doctoral dissertations accepted by universities in the United States of America and Canada, 1934-1949, on subjects related to the ecology and management of fisheries. The theses are arranged alphabetically by author and according to subject headings. There is also an author index and a list of colleges and universities represented. All theses are on file in the libraries of the institutions where they were accepted. It is stated that the list is reasonably complete through 1948 but not for 1949.

G.V.H.

FWS 9.16 FISH CULTURE UDC 639.3.05

Hall, C. B. *Ponds and Fish Culture for Pleasure or Profit.* Faber and
1949 Faber, Ltd., London, England. 244 pp., illus. In English.

A general book covering various subjects on pond construction, water supply and methods of culture of gold fish, carps, trout, and other species in both ornamental garden ponds and ponds for fish farms. Mentions types of ponds required, good sites for pond construction, and building materials recommended. A major part of the book is devoted to the discussion of trout culture, covering the construction and management of the hatchery, the water supply, selection and handling of the breeder and care of the eggs and fry. A table of food and growth ratio for trout is given. The methods for increasing natural food in ponds through application of organic manure and chemical fertilizers are briefly described. Treatment of ailments and disease are comprehensively discussed. The author also mentions some methods of fish and ova transport and preparation of fresh-water fish for the table.

S.Y.L.

FWS 9.16 FISH CULTURE UDC 639.31

Huet, Marcel. *Appréciation de la valeur piscicole des eaux douces* (Eval-
1949 uation of possibilities for fish culture in fresh waters). Travaux de la Station de recherches de Groenendaal, Série D, No. 10.

Belgium, Ministère des Colonies, Direction de l'agriculture, de l'élevage et de la colonisation, Brussels, Belgium. In French. Price 20 fr. (Belgian)

After briefly tracing the biological cycle of fresh waters, the author examines the factors influencing the productivity of inland waters, particularly to determine the biogenetic capacity and the use of the Leger formula. Two chapters are devoted to evaluating the suitability of running and stagnant waters for fish culture, as well as to describing the optimum conditions for establishing fish culture stations. Illustrations and photographs aid in the understanding of the text.

J.C.

FWS 3.39 CANNED FOODS - NUTRITIVE VALUE UDC 641.1

National Canners Association Research Laboratories. *Canned Foods in*
1950 *Human Nutrition.* Washington, D.C., U.S.A. 264 pp., bibl. In English.

A reference source on the nutritive values of commercially canned foods including general composition, proteins and amino acids, minerals, ascorbic acid, carotene and vitamin A, vitamin D, thiamine, riboflavin, niacin. Modern concepts of nutrition are discussed, as well as the storage and the preparation of canned foods for serving. The contents of canned foods are listed in 11 tables, including one table giving the vitamin A and D content of the solid portion of selected canned fish and one giving the percentage of recommended daily intake of essential amino acids furnished by average size servings of various canned fish and meat products. A selected bibliography of some 180 titles is included.

E.H.

FWS 2.4 REFRIGERATION OF FOOD UDC 664.8.037

Monvoisin, A. *La conservation par le froid des denrées périssables* (Pres-
1950 ervation of Perishable Goods by Cold). 4th ed. Dunod, 92 rue Bonaparte, Paris 6e, France. xiv+618 pp., 240 illus. In French. Price : 2,780 fr.

A textbook on refrigeration and freezing of foods, including general chapters on the chemistry and microbiology of perishable foods, on thermodynamics, production of cold, refrigeration machinery, etc., and special chapters on refrigeration of meat, fish, poultry, eggs, milk products, fruits, vegetables, etc. There appears to have been no revision of the sections on fish products in this edition. No references or bibliography are given.

E.H.

FWS 3 FISH PRESERVATION UDC 664.95

Jarvis, N.D. *Curing of Fishery Products.* Research Report 18. United
1950 States Department of the Interior, Fish and Wildlife Service, Washington 25, D.C., U.S.A. 271 pp., illus., bibl. In English. Price US$0.60.

A reference handbook on the problems of fish curing (salting and drying, pickling, smoking, preparation of spiced and delicatessen products) gathered from an extensive study of published material and from the author's personal experience. It includes information from recent technical studies of the principles on which fish curing is based, discusses improvements in methods and equipment, and describes the standard methods.

E.H.

FWS 2.4 REFRIGERATION OF FISHERY PRODUCTS UDC 664.951.037

Beard, Harry R. *Some Technological Aspects of the Fresh Frozen Seafood*
1950 *Industry.* National Fisheries Institute, Inc., 724 Ninth Street, N.W., Washington 1, D.C., U.S.A. 32 pp. In English. Price US$0.50.

Reprints a series of technological information leaflets published by the National Fisheries Institute, Inc. The pamphlet serves as a useful guide for the icing and packing of fresh fish, the freezing of seafood, and the storage and transportation of frozen products.

M.J.

FWS 3.5 SALTED COD, HAKE, ETC. UDC 664.956.2

Hawes and Company (London) Ltd. *Review of Salted Fish Production and the European Markets 1949-50 Season.* Imperial House, London E. C. 2., England. 61 pp. In English.

This review considers the production and marketing of salted fish, in particular the salted products prepared from cod and similar species, during the 1949-50 season. The production of the salted fish industries in Canada and Newfoundland, Denmark (including Greenland), Faeroe Islands, France, Great Britain, Iceland, and Norway is surveyed in the light of current statistics for 1949, 1948, and 1947. Production, marketing, and consumption in the European markets (represented by Greece, Italy, Portugal, and Spain) during the 1949-50 season are also considered.

L.P.D.G.